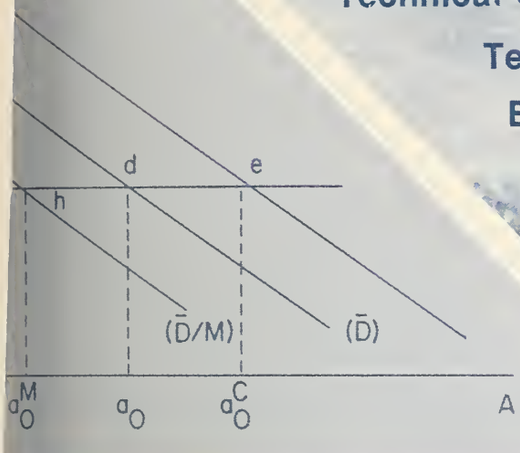
Assessing Amenity Resource Values

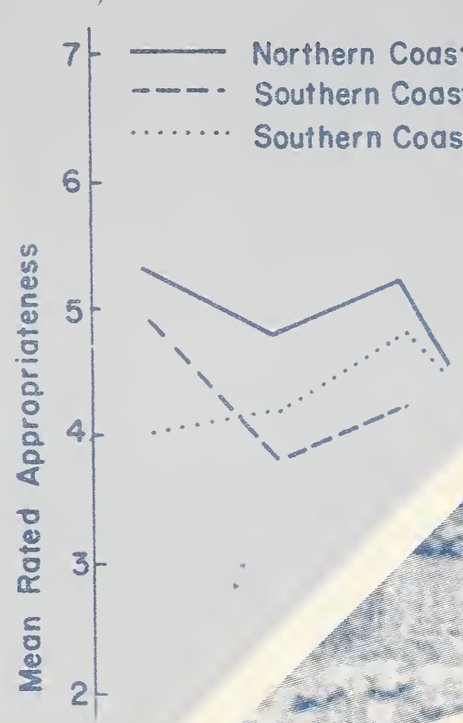
Technical Coordinators

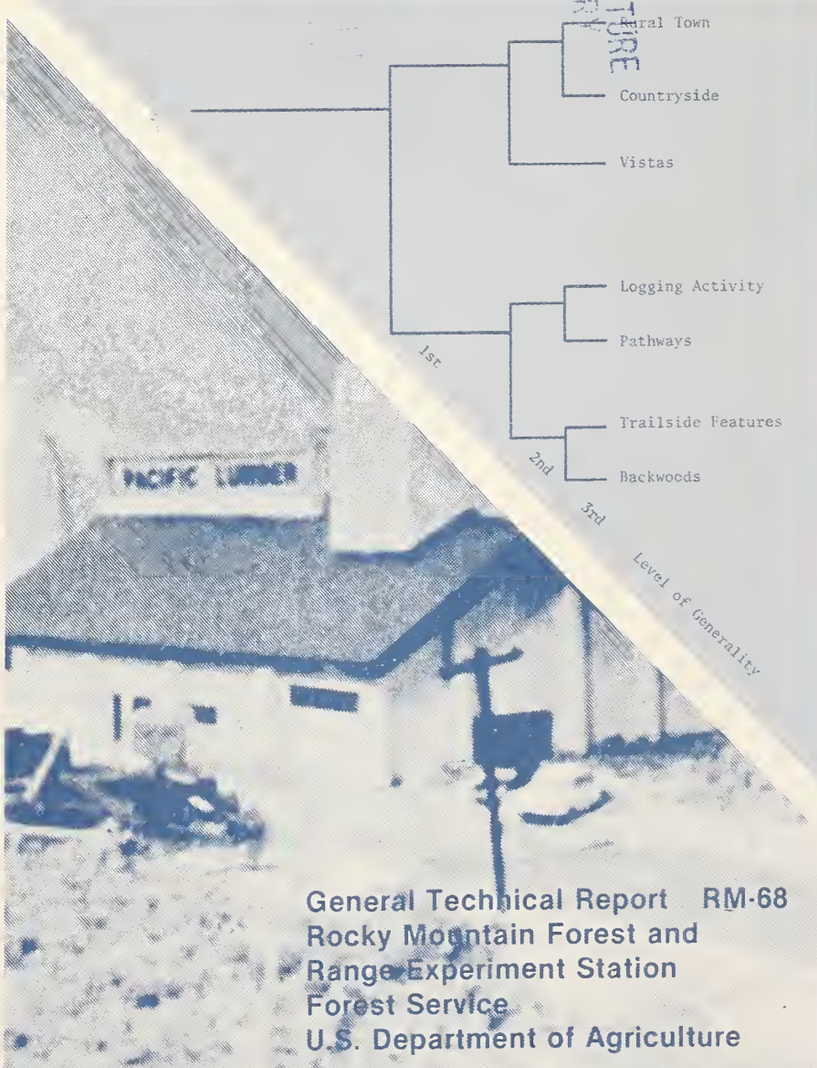
Terry C. Daniel

Ervin H. Zube

B. L. Driver







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ABSTRACT

Papers from a workshop and symposium at the Ninth Annual Meeting of the Environmental Design Research Association cover identifying environmental features responsible for perception of environmental quality, dimensions of wilderness experience, uses of wildlife, integrating user-based assessments with economic models, and the interface of natural and urban landscape elements.

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Assessing Amenity Resource Values

Terry C. Daniel

Ervin H. Zube

and

B. L. Driver[1]

Technical Coordinators

[1/] The technical coordinators are Professor of Psychology and Renewable Natural Resources, University of Arizona, Tucson; Director, School of Renewable Natural Resources, University of Arizona, Tucson; and Social Scientist, Rocky Mountain Forest and Range Experiment Station, Station's headquarters is in Fort Collins, in cooperation with Colorado State University.

FOREWORD

Managers of publicly owned forest and range lands are expected to carry out programs that provide the combination of goods and services that best meets social needs and preferences. The Multiple Use Sustained Yield Act, the National Environmental Policy Act, the Forest and Rangeland Renewable Resources Planning Act, the National Forest Management Act, and the Federal Land Policy and Management Act are clear in requiring all potential values--both commodity and noncommodity--be considered in assessments of alternative land management practices. To comply with these legal requirements managers must measure and compare the relative values of all possible outputs.

Increasing awareness of the importance of scenic beauty, nongame wildlife, wilderness, clean air and water, and other noncommodity products has revealed a lack of adequate information and methodology for comparing values of these outputs of management with values of commodity outputs such as wood fiber and livestock forage. Assistant Secretary of Agriculture M. Rupert Cutler referred to this problem in August 1978, when speaking at a conference in Missoula, Mont. He raised the question: "How do we balance a quantifiable commodity value and amenity values that elude quantifiable descriptions?"

Better understanding of noncommodity benefits of forest and range lands is critical to proper land management throughout the nation. Thus, the Rocky Mountain Forest and Range Experiment Station is pleased to have co-sponsored two symposia at the University of Arizona dealing with techniques for assessing noncommodity values of wildlands.

David E. Herrick, Director
Rocky Mountain Forest and
Range Experiment Station

CONTENTS

INTRODUCTION

This volume contains a series of papers representing a cross section of esthetic resource assessment and evaluation methods. The methods differ with respect to the particular esthetic or noncommodity resources to which they are addressed, and they are in different stages of development. There is, however, a central feature that all have in common--all are "user-based" methods: The basis of each method is some relatively direct expression of preference or value judgment by human "consumers" of esthetic resources.

The user-based approach stands in contrast to expert appraiser methods, where evaluation is entrusted to the judgment of one or a few trained or talented individuals. It also differs from arbitrary modeling approaches, where "weights" or relative importance values are assigned or derived based upon an often elaborate set of rational assumptions. User-based methods accept the fact that the value of any resource ultimately rests upon human needs and desires.

In the attempt to assess and evaluate esthetic or noncommodity resources, user-based methods refer rather directly to human preferences and desires. The quantity and quality of esthetic resources is assessed by rankings or by more sophisticated quantitative scales derived from expressed choices, ratings, or other judgments supplied by human observers. Evaluation, the assigning of comparable indices of worth to various quantities and qualities of esthetic resources, is also based upon expressed choices and preferences of "users." Often, however, additional assumptions and calculations are employed in an effort to make these evaluations commensurate with market-price values available for commodity resources.

Most of the papers contained in the following pages were originally presented at a symposium and a workshop held at the Ninth Annual Meeting of the Environmental Design Research Association at the University of Arizona in April of 1978. Papers by S. Kaplan, Palmer, Brookshire and Crocker, Wohlwill, R. Kaplan, and Schomaker were presented at a symposium on environmental esthetics. The papers by Haas et al., Shaw, and Arthur were presented at a workshop on current research on the esthetic value of wildlife. The initial paper by Daniel and Zube and the paper by King were prepared especially for this volume.

The papers by S. Kaplan and Palmer discuss different approaches to identifying specific features of the environment that may be responsible for the perception of environmental quality. Palmer presents a case study of a hiking trail environment that includes both purely natural and predominantly manmade elements. S. Kaplan's paper addresses several issues in the more general effort to identify and define the elements of the environment that combine to affect esthetic values.

The paper by Haas et al., presents the results of investigations into the dimensions of backcountry and wilderness experiences. Shaw and Arthur both discuss the relationships between consumptive (e.g., hunting) and nonconsumptive (e.g., observing) uses of wildlife.

Papers by Brookshire and Crocker and by King represent initial efforts at the difficult task of evaluation. Both papers discuss the integration of user-based assessments with economic models and methods to develop commensurate values for esthetic resources.

Wohlwill addresses the interface of natural and urban elements in the landscape. Both Schomaker and Wohlwill use landscape simulation techniques to assess the effect of alternative management proposals for manmade elements on the perceived scenic quality of different natural landscapes.

R. Kaplan describes the development and application of an environmental quality assessment method that was found useful and effective in the context of both natural and urban landscapes.

Schomaker presents a study of natural landscape esthetics, and the effect of various landscape modifications on observers' perceptions of scenic beauty.

Together, the papers in this volume characterize the ongoing effort to develop reliable and effective methods for assessing and evaluating noncommodity resources. These efforts must be viewed as the beginning of progress on this essential task--much has been accomplished, but much remains to be done if esthetic and other resources are to be allocated rationally to meet the wants and needs of our society. It is our hope that bringing this important work together in one volume will facilitate coordination and cooperation among the many disciplines and investigators working on noncommodity resource assessment and evaluation.

Terry C. Daniel, Professor
Department of Psychology
University of Arizona

Ervin H. Zube, Director
School of Renewable Natural Resources
University of Arizona

ASSESSMENT OF ESTHETIC RESOURCES

Terry C. Daniel and Ervin H. Zube[1]

All resources are defined in terms of their ability to meet human needs or fulfill human desires. In this respect, esthetic resources, including landscape scenic beauty, wildlife, and the opportunity for outdoor recreation and wilderness experiences, are no different from the more traditionally recognized resources such as wood, water, and minerals.

Man's need for esthetic resources, in the biological or survival sense, may not yet be established, but there are increasing indications that pleasant scenery and solitude and quiet provided by natural landscapes have positive effects on physical and mental well-being. Certainly the human desire for beautiful landscapes and undisturbed wildland areas is well established and is documented by numerous legislative acts. The value of esthetic resources, then, is ultimately determined by the wants and needs of society, as is the value of any other resource. There are, however, some significant differences in the way in which the benefits of esthetic resources are realized.

Many natural resources are appreciated indirectly. The benefits of standing timber in the forest, for example, may not be realized until it is converted to lumber and a house is constructed in some distant city. Complex systems of harvesting (or extraction), processing, transportation, and exchange intervene between wood, minerals, and many other basic resources and the consumer who finally receives the benefits of those resources. The benefits of esthetic resources, on the other hand, are generally realized directly by the "consumer." The perceptual experience afforded by a view of a beautiful landscape, or a tranquil moment near a mountain stream, or a chance glimpse of some wild creature in its natural habitat has immediate personal value for the perceiver. Only the observer's own perceptual system intervenes between the resource and his appreciation of it.

Perhaps the most important distinctions between esthetic and other resources arise in the attempt to evaluate them. The value of a mineral deposit or of a standing tree (as a lumber source) is typically determined by its price in some appropriate market. The market pricing system provides a quantitative (dollar) value for a great many goods and services, including many natural resources. These dollar values can be compared across resource categories. Esthetic resources, however, have not traditionally been part of the market system, and it has proven very difficult, if not impossible, to evaluate them in the same manner as market or commodity resources.

The need to assess and evaluate esthetic resources arises largely because of their intimate relationship with traditional market or commodity resources. When trees are harvested from a forest for use as lumber and fiber, their removal has an effect on the scenic and wilderness values represented by that forest. Alternatively, if a forest area is set aside for wilderness, the implication is that the noncommodity resources represented have more value to society than the commodity resources that are foregone. While the market place provides a means for determining gain achieved or foregone by harvesting or not harvesting a forest, there is currently no generally accepted means for determining the amount of loss or gain in esthetic benefits.

Similar trade-offs almost invariably occur between other commodity and esthetic resources. Further, there are frequently important trade-offs among noncommodity resources--as when increasing wildland recreation opportunities by providing better access for more people threatens to degrade scenic beauty and/or wilderness values. If rational decisions are to be made in these situations--rational in the sense that the alternative with the greatest net value to society will be chosen--systematic, reliable assessments must be made of the value of esthetic resources.

To assess the value of esthetic resources (or any resource for that matter) these resources must first be identified. This task has to some extent already been accomplished--the National Environmental Policy Act and a number of other national, regional, and state laws and policies have identified many important esthetic resources. Landscape scenic beauty, wildlife, wilderness, outdoor recreation, esthetic aspects of the air, water, and sonic environment, and symbols of cultural, historical, or archeological significance have all been specifically identified in protective legislation. While these acts do not provide detailed definitions, they have at least generally identified noncommodity resources that contribute to social welfare and individual well-being.

1/ The authors are Professor, Department of Psychology, and Director, School of Renewable Natural Resources, University of Arizona, Tucson.

After an esthetic resource has been identified, the quantity and quality of that resource must be determined before values can be assigned. The economic concept of supply and demand recognizes the essential role of the "amount available" in determining value. If landscapes of great beauty abounded in virtually limitless supply throughout the country, the value of any particular scenic area might be rather low. If beautiful landscapes are scarce, each area of high scenic beauty must be held as much more precious. Therefore, in order to evaluate esthetic resources, means must be found for assessing the available quantities of different grades (high to low quality) of landscapes, wildlife species, wilderness areas, recreation opportunities, and other noncommodity resources. For example, to determine the value of a specific forest landscape as a scenic resource, the quality of that landscape must be determined; i.e., whether it is extremely beautiful (more so than 90 percent of all landscapes of this type) or only moderately so. The available "supply" of landscapes of that type and quality must then be assessed before the question of value, relative to other goods, services, and resources can be approached.

Value, as it is being used here, is a strictly relative term. The value of one resource can only be understood by reference to the value of some other resource. To determine relative values, resources must be assessed in commensurate terms--determing whether producing 100,000 more acre-feet of irrigation water per year is more or less valuable than sustained production of 10 million board feet of lumber requires that the value of each alternative be expressed in some common terms, such as dollars. To make such comparisons, either the noncommodity resources must be evaluated in market-price terms, or some other common measure of value must be found that can be applied to both alternatives (e.g., units of energy expended or conserved, politically determined "importance," or some other commensurate gauging scheme).

Evaluation of esthetic resources poses significant philosophical and ethical questions, but assessment and evaluation methods are of much more than just philosophical interest. Resource managers, and in a broader sense society as a whole, are daily faced with questions requiring difficult choices between commodity and noncommodity resources. Currently there is no straight-forward way to deal with these questions. A major obstacle is the lack of suitable methods for assessing the quantity and quality of esthetic resources and for evaluating them in commensurate terms with other social values. Substantial progress is needed in the development of esthetic evaluation methodologies if these resource allocation questions are to be answered in a way that will serve the social good.

CONCERNING THE POWER OF CONTENT-IDENTIFYING METHODOLOGIES[1]

Stephen Kaplan[2]

Environmental psychologists are often asked questions such as "How do people experience the environment?" or "What matters to people in the environment?" Clearly the answer to such questions involves preference, but it does not involve only preference. It also concerns the issue of what people find salient in a given scene, the issue of that content which transcends a given scene and provides a basis for responding to a whole group of scenes in a similar fashion.

People react to what they experience (and presumably the outdoor environment is no exception) in terms of commonalities, in terms of classes or categories. Any scene is perceived as a particular instance of a larger class of scenes. What class it is an instance of is not necessarily obvious. A given scene, for example, might be expected to be categorized quite differently by a park manager, a park visitor, a farmer, a forester, a landscape architect, a real estate agent, and so on.

Knowing the basis for identifying content used by the general public is not merely of theoretical interest. It is essential if we are to generalize beyond the boundaries of a particular study, as well as being of great value in making comparisons across different studies and across environments. Content is, of course, not a novel consideration in research on landscape esthetics. Most often, however, it is defined on a priori basis by the investigator. Some classification systems are based on land form and land use, others on management practices, and so on. Unfortunately, effort is rarely made to determine whether such expert-determined categories also serve as categories for the general public. One study making such a comparison showed little relationship between what the experts generated and what the public perceived (R. Kaplan, 1977a).

METHODOLOGICAL CONSIDERATIONS

If one wishes to discover the categories of environmental content that people respond to, there is no way around providing test subjects with a great variety of scenes to categorize. Defining a category is dependent upon multiple instances. While the importance of environmental sampling is widely recognized in principle, in studies of landscape esthetics it is often slighted. In some cases the problem stems from a desire to examine too many types of scenes, forgetting that each type needs replication. Further, having many people react to many scenes readily leads to an overwhelming quantity of data. There is the justifiable fear that such a study could never be analyzed, and if analyzed, never written up, and if written up, never understood.

Fortunately, there is a straightforward solution to the problem. A set of Content Identifying Methodologies (CIM) can be used to identify meaningful content groupings and partition the many instances into a few groupings. Ideally the resulting groupings are not only manageable, but also interpretable and communicable. As the examples I shall mention later suggest, in our experience this hope has been borne out in practice.

There are limits on how much one can ask research subjects to do. With, say 30 to 50 scenes, one cannot very well ask the subjects to rate each one on many different scales. This raises problems for traditional semantic differential procedures. However, asking people for a simple preference judgment works out very well. It is something that people do easily and quickly, it provides solid data for CIMs, and the choice itself constitutes information one presumably would want. Utilizing a broad sample of scenes and a simple preference judgment, it is effective to use two different CIMs. A nonmetric factor analysis and a hierarchical cluster analysis, used together have been found effective. Each CIM works well alone, and they work well together. They provide complementary information, together yielding a larger picture than would be possible with either alone (R. Kaplan 1974, 1975).

1/ Paper presented at the symposium on environmental esthetics at the Ninth Annual Meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 10, 1978. I would like to thank Roger Ulrich, Thomas Gallagher, William Hammitt and Eddie Anderson for permission to use their results and photographs in this paper. The work reported here was supported in part by the Northcentral Forest Experiment Station, Forest Service, USDA.

2/ The author is Professor of Psychology at the University of Michigan, Ann Arbor.

SOME ILLUSTRATIVE STUDIES

The CIM methodology has been applied to a number of different environments. For the most part studies have been focused upon natural or largely natural settings. Across five studies (Ulrich 1973, Gallagher 1977, Hammitt 1978, Anderson[3/] and R. Kaplan 1977a) the CIMs employed yielded a total of 27 content categories or dimensions. Initial inspection of these dimensions suggests a rough distinction between those dominated by particular or special content (6 dimensions) and those where the spatial configuration is the organizing theme. The latter are futher divided into four types. A dimension is, of course, defined by multiple scenes, some four to eight in most of the instances considered here.

PARTICULAR CONTENTS

Particular content dimensions are often defined by the context of a particular study. For example, Gallagher (1977) found buildings in a natural setting seem to constitute a particular content (fig. 1, top left). In other studies buildings seem to have a particular content property not necessarily shared by other human-produced elements such as bridges, parking lots, and fences.

One of the dimensions in Hammitt's (1978) study of a bog environment also focuses on the built component in the natural setting. Here, various scenes which included a boardwalk -- a distinctive aspect of a relatively undifferentiated environment -- are grouped together (fig. 1, top right).

Another basis for a particular content category is special knowledge of the population being studied. If there are several scenes representing a single, characteristic type of environment in the area, these may form a dimension even though they are not that similar visually. For example, Anderson (1978) developed a "red pine forest" dimension (fig. 1, bottom left), a configuration well known to local residents.

In R. Kaplan's storm drain study, one dimension included what drain engineers call "impoundments," even though the participants in the study would have been unlikely to have heard the word in that context (fig. 1, bottom right).

The existence of these categories is consistent with the recent emphasis in a number of behavioral fields on the importance of things in human perception and thought. Anthropologists such as Pfeiffer (1972) and Campbell (1974) have pointed to subjects' ability to separate things out of a physically continuous environment as an important facet of human evolution. The importance to the thought process of mental representations of things in the world has increasingly been recognized by cognitive psychologists such as Posner (1973) and Rosch (1977). The use of "thing" in this context is somewhat abstract. It refers not only to pick-up-able entities, but also to other patterns of experience that are sufficiently separable and coherent to be subject to isolation and manipulation, at least in the mind if not also in the world. In this cognitive sense of "thing," buildings, bodies of water, and red pine forests all constitute good examples.

SPATIAL CONFIGURATIONS

Even more striking than the particular content dimensions, however, is the number of dimensions for which no such distinctive content could be identified. In these cases it is the spatial configuration of the scene that appears to account for the groupings. The "space" in question here is not the two-dimensional space of the picture plane, but the inferred three-dimensional space of the scene which the photograph depicts.

The central role of space in landscape content groupings did not come as a total surprise. There had been indications of the importance of space, (R. Kaplan 1973, S. Kaplan 1975) and the concept of mystery, a powerful predictor of preference, is inherently spatial. Mystery is based on the idea of information gained by going deeper into the scene. Implicit is the notion that certain scenes are appreciated for what it would be possible to do in them. Thus in the case of mystery, "Potential action" is critical to its role in preference. There appears to be a sound basis on theoretical grounds for extending this notion to other spatial configurations as well.

Consider, for a moment, the informational approach to understanding human nature. From this point of view, a human is an active, anticipating organism, always evaluating and preparing to cope with new situations (Kaplan & Kaplan 1978). Presumably, this evaluation and preparation are based in part on the presence of wild animals or other dramatic dangers. But presumably also, there is an evaluation in terms of the possibilities for and limitations of action. An important aspect of a new situation must be what it makes possible, what it permits one to do.

The idea of a rapid, automatic, unconscious evaluation as a component of the perceptual process has recently received support from an unexpected direction. Gibson (1977) has introduced into his framework the concept of "affordance." An affordance is what an object offers the perceiver, or in other words, what the perceiver would be able to do with the object. The concept of "potential actions" is, of course, quite similar, except that it applies to scenes and spaces rather than objects.

[3/] Doctoral dissertation in progress, Univ. Mich.

Figure 1.--Examples of specific content dimensions from four different studies.

Open, undefined scenes

Whether the scene is "deep" or "shallow" (S. Kaplan 1975) is likely to provide some grouping information about potential actions. The studies under discussion here, however, indicate the spatial component is considerably more complex than that. One such complication is the matter of how the space is defined. Some landscapes are not clearly either deep or shallow; they are flat, open, and in general lacking in spatial definition. Although the "quantity" of landscape on the picture plane between the foreground and the horizon is generally as great as in any other grouping of landscape photographs, these scenes lack depth cues.

Dimensions of depth are not uncommon in these studies; all but one of the studies had such a grouping. Ulrich's (1973) roadside study (fig. 2, top) is rather typical of this group. R. Kaplan's (1977a) scenic highway study yielded a dimension of depth (fig. 2, bottom), which is quite similar to a dimension from Anderson's forest practices study (fig. 3, top left). A second forest practices dimension, focusing on the visual impact of clearcutting, also falls in this grouping (fig. 3, top right). The dimension from Hammitt's bog environment study fitting this grouping represents a physical environment quite different from the others -- it depicts the bog mat itself (fig. 3, bottom). However, visually it is similar in form to other examples of the depth dimension.

The interpretation of the open, undefined spatial configuration in terms of "potential action" is necessarily rather negative. The very lack of spatial definition makes such scenes difficult to evaluate. There are insufficient cues to know exactly what actions are or are not possible Even a clear judgment as to the distance involved in traversing such an area is hard to make. Such settings reliably receive low preference ratings.

Spacious, well structured scenes

In marked contrast to the open, undefined configuration is the spacious, well structured configuration. The five studies include five such dimensions, two in one study and one in each of three. Trees play an important role in structuring the space in these scenes. In the example from the R. Kaplan scenic highway study (fig. 4, top left) and the Ulrich's roadside study (fig. 4, top right), the near trees play a central role. The other dimension from the Ulrich Roadside study belonging in this grouping depends on trees at a somewhat greater distance from the viewer to structure the space (fig. 4, bottom left) as does the example from the R. Kaplan drain study (fig. 4, bottom right).

These scenes through their greater depth suggest room to operate, places to go, opportunities for locomotion. Given such opportunities for action, one would expect these dimensions to receive high preference ratings, as, in fact they do.

Enclosed scenes

A particularly interesting type of grouping involves spatially well-defined dimensions with relatively limited depth. All these examples provide a sense of enclosure; they contain a screened or protected area in which one might hide. They are not, however, in the nature of cramped one-person hiding places. In fact, most of them seem to offer at least enough room to hide a small car.

Since "enclosure" is as much a functional distinction as a purely visual one, it is perhaps not surprising that the visual forms that seem appropriate to this grouping are highly diverse. There are seven such dimensions, with each of the studies represented. The dimension from the Anderson forest practices study is in a relatively heavily wooded area (fig. 5, top left). The Hammitt bog environment contributes a dimension both more open and more complex (fig. 5, top right). Two dimensions in this grouping come from the Gallagher naturalized landscape study. For one of these, the enclosure is created by fairly complex configurations of natural elements (fig. 5, bottom left). For the other, elements of the built environment combine with natural features to create the scenes of enclosure (fig. 5, bottom right).

From the "potential action" point of view, the enclosure type of spatial configuration is perhaps the most fascinating of all. Here one is promised a place of respite, a place of relative safety. One is provided with what Appleton (1975) in his perceptive analysis of landscape appreciation has called "refuge." Here, in other words, is an opportunity to escape notice, to see without being seen. Certainly an environment offering such an amenity would be desirable. However, "enclosed" groupings are not uniformly preferred. Some may be visually too unspacious, or lack definition.

Blocked views

The final category of spatial configurations is blocked scenes, where visual access is prevented. There are relatively few instances of these in the example studies. There are four such dimensions, two from the Ulrich roadside study (fig. 6, top), and a heavily forested grouping from the R. Kaplan scenic highway study (fig. 6, bottom). The prairie dimension from the Gallagher naturalized landscape study also falls in this grouping; in this instance the tall prairie grass itself created a perceptually blocked space.

Unlike the "enclosed" settings, the blocked ones prevent visual surveillance. They make it difficult to find a direction in which to proceed. One would expect such settings to be avoided

Figure 2.--Examples of open, undefined spaces from the roadside and scenic highway studies.

Figure 3.--Examples of open, undefined spaces from the forest practices and bog environment studies.

Figure 4.--Examples of spacious, well structured scenes from three different studies.

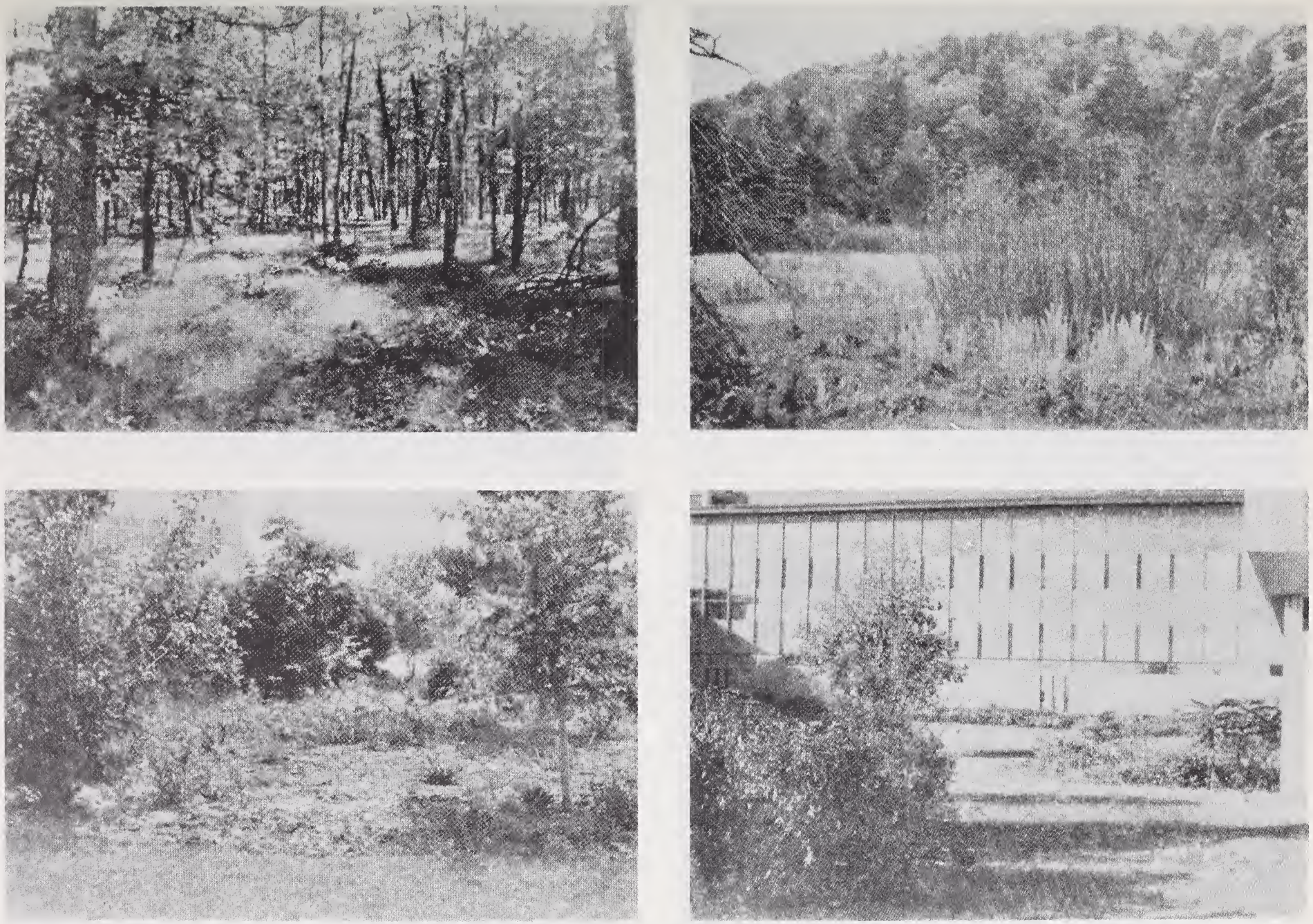

Figure 5.--Examples of enclosed scenes from three different studies.

Figure 6.--Examples of blocked views from the roadside and scenic highway studies.

on survival grounds and to be low in preference, as they in fact are.

The powerful role of visual access is strikingly demonstrated by this category of spatial configurations. A setting dominated by tall grass may not actually be impenetrable, but it looks as if it were. The embankment, which is impenetrable -- although one might climb over it -- is reacted to similarly. In addition to not seeing how one would go, and to not being able to visually evaluate the space as a whole, tall grass and rough foliage scenes appear to be even shallower than is in fact the case. Fine textures, near surfaces, by contrast, tend to enhance the sense of depth -- in general, coarse textures are perceived as closer and fine textures as more distant. This is a familiar phenomenon to creators of Japanese gardens and, for that matter, to mowers of American lawns.

SOME REFLECTIONS ON CONTENT

Let us return to the question with which this paper began. What do people find salient in a given scene? What is it that results in a whole group of scenes being responded to in a similar fashion? There are many ways to categorize a particular environment. Use of content-identifying methodologies and preference ratings by untrained participants yields categorizations that are distinctly different from those generated by various professionals. The meaningful groupings identified permit comparisons across diverse studies.

Another interesting property of the groupings is how profoundly informational they have turned out to be. The majority of the expert-generated category systems have little to do with the way people process information. Results of the example studies suggest that what people experience as salient in the landscape involves informational patterns (R. Kaplan 1977b, Kaplan & Kaplan 1978) readily interpretable in terms of requirements for adaptive behavior.

The way space is organized provides information about what one might be able to do in that space. A relatively brief glance at a scene communicates whether there is room to roam or whether one's path is blocked.

Thus, there appears to be both an empirical and a theoretical basis for categorizing landscape scenes. As is often the case with a satisfying research experience, these categories would have been hard to anticipate, but in retrospect make intuitive sense. These findings may also play a useful role in the further development of landscape assessment research. In a recent review, Stokols (1978) argues that generalizing findings across different settings requires a "theoretically based taxonomy of environments." The identification of consistent and interpretable patterns across a variety of different settings constitutes a first step toward developing such a taxomony.

LITERATURE CITED

Appleton, J. 1975. The experience of landscape. Wiley, London.

Campbell, B. G. 1974. Human evolution: An introduction to man's adaptation. Aldine, Chicago.

Gallagher, T. J. 1977. Visual preference for alternative natural landscapes. Ph.D. diss., Univ. Mich., Ann Arbor.

Gibson, J. J. 1977. The theory of affordances. p. 76-82. In Perceiving, acting, and knowing, R. Shaw and J. Bransford (eds.) Erlbaum, Hillsdale, N. J.

Hammitt, W. E. 1978. Visual and user preference for a bog environment. Ph.D. diss., Univ. Mich., Ann Arbor.

Kaplan, R. 1973. Predictors of environmental preference: Designers and "clients." p. 265-274. In Environmental design research, W.F.E. Preiser (ed.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, R. 1974. A strategy for dimensional analysis. In Man-environment interactions: Evaluations and applications, Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, R. 1975. Some methods and strategies in the prediction of preference. p. 118-129. In Landscape assessment: Values, perceptions, and resources, E. H. Zube, R. O. Brush, and J. G. Fabos (eds.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, R. 1977a. Preference and everyday nature: Method and application. In Perspectives on environment and behavior, D. Stokols (ed.) Plenum, N.Y.

Kaplan, R. 1977b. Down by the riverside: Informational factors in waterscape preference. In River recreation manage. and res. symp. USDA For. Serv. Gen. Tech. Rep. NC-28, North Cent. For. and Range Exp. Stn., St. Paul, Minn.

Kaplan, S., and R. Kaplan. (eds.) 1978. Humanscape: Environments for people. Duxbury Press, Belmont, Calif.

Lynch, K. 1960. The image of the city. Mass. Inst. Tech., Cambridge.

Pfeiffer, J. E. 1972. The emergence of man. 2nd ed. Harper and Row, New York.

Posner, M. I. 1973. Cognition: An introduction. Scott and Foresman, Glenview, Ill.

Rosch, E. 1977. Human categorization. In Studies in cross-cultural psychology, N. Warren (ed.). Academic Press, New York.

Stokols, D. 1978. Environmental psychology. Annu. Rev. Psychol. 29:253-295.

Ulrich, R. S. 1973. Scenery and the shopping trip: The roadside environment as a factor in route choice. Ph.D. diss., Univ. Mich., Ann Arbor Avail. as Mich. Georgr. Publ. 12, Dep. of Geogr.

THE CONCEPTUAL TYPING OF TRAIL ENVIRONMENTS: A TOOL FOR RECREATION RESEARCH AND MANAGEMENT[1]

James F. Palmer[2]

Backcountry recreation is on the increase in this country. It is estimated that by 1980 a total of 120 million Americans will each spend an average of 24 days per year participating in walking-related activities (U.S. Senate 1974). One of the great recreation challenges in the near future will be to make adequate numbers of trails available for hiking and related activities.

There is an increasing need for systematic research to aid land managers in the selection of new trails and the management of existing trails. There is a growing body of backcountry recreation research (Clark 1977, Marsh 1971, Stankey and Lime 1973), but the most comprehensive studies have focused on only a few areas; the Great Lakes region (Lucas 1964, Stankey 1973), the Rocky Mountains (Stankey 1973), and the Pacific Northwest (Hendee et al. 1968) have attracted the most attention. The Appalachian Trail, in spite of its high frequency of use, has attracted only a few localized studies (Bolduc 1973, Murray 1972, Sargent 1969).

While committed to being responsive to user needs (National Park Service 1978), the Appalachian Trail Project Office of the National Park Service is understandably hesitant to base decisions on recreation patterns in western wilderness areas. The Appalachian Trail is thought to be a fundamentally different type of resource. Although the Trail is over 2,000 miles in length, it is normally considered to be only a few hundred feet wide. Even though it is one trail, it leads hikers through a diversity of environments. Each of these environments contributes to the trail's character; each provides a different setting for experiences; each is suitable for different activities.

There is a need for a procedure by which Appalachian Trail environments can be classified into types that are useful for management and planning purposes. Previous recreation research has not produced an adequate trail classification system reflecting user perceptions.

In cooperation with the U.S. Forest Service and the American Conservation Association, the National Park Service engaged the Institute for Man and Environment at the University of Massachusetts to develop an appropriate procedure for classifying Appalachian Trail environments. The management utility of that procedure is to be demonstrated by a pilot application in Massachusetts. The preliminary findings of this study are reported here.

METHOD

Trail Inventory

During July and August 1977, the author hiked the Massachusetts section of the Appalachian Trail to establish personal knowledge of the study area. A conscious attempt was made to experience a variety of climatic and hiking conditions. A field diary was kept to record trail experiences and encounters with other hikers and local residents.

Two different strategies were used to compile a photographic inventory. The first strategy was essentially random. Photographs were taken systematically at half-hour intervals during actual walking time. At each stopping point, two nonoverlapping photographs were taken at random angles. These random photographs provide a sample of trail conditons and surroundings as experienced by a hiker passing through Massachusetts. The second strategy was essentially subjective. Photographs were taken of distinctive environments that the investigator felt represented particularly important aspects of the trail. This subjective record generally captured "rare" conditions not adequately represented in the random inventory. The time and place of each photograph was logged as part of the field diary.

1/ Paper presented at the symposium on environmental esthetics at the Ninth Annual Meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 10, 1978. Appreciation is expressed for the constructive criticism and editorial assistance of Ellen McClelland Lesser and Douglas Owen. This research was conducted under a grant from the American Conservation Association, National Park Service, and USDA Forest Service, for which Hugh C. Davis and D. Geoffrey Hayward are principal investigators.

2/ The author is with the Institute for Man and Environment, University of Massachusetts, Amherst.

Sorting Trail Environments

The data for classifying trail environments into types were derived from judgments made by ten respondents. The respondents were environmental professionals in disciplines ranging from the visual arts to policy planning and natural resources management to psychology. Their personal experiences with the outdoors ranged from day hikes through the New England countryside to weeks-long expeditions in the Alaskan Brooks Range.

Borderless color prints (3 1/2" x 5") of the 369 photographs taken in the inventory were shown to each respondent, allowing as much time as necessary to become familiar with the scenes. Each respondent was asked to:

> Sort the photographs into piles which you feel represent essentially similar kinds of trail environments...You may make as many or as few piles as you want, with as many or as few photographs in each pile as you want... The idea is that photographs are put together if they represent the same general type of trail environment so different piles will represent different trail environments.

When the sorting task was completed to each person's satisfaction, they were then asked to:

> Describe in your own words the important characteristics of that environment. Then, describe the sorts of activities or experiences which you expect to occur to hikers in this environment.

All categorizations and descriptions were recorded on coding sheets for subsequent analysis.

Cluster Analysis

Cluster analysis is the generic term for the numerical methods of classification used in this study to identify distinct types of trail environments. Essentially, the analysis determines the degree of empirical relationship between each possible pair of objects using an appropriate measure of association between the variables. The most closely associated pair is joined or "clustered" and is treated as a new object. The process is repeated until all objects in the set have been joined together. The essence of the analysis lies in choosing the appropriate measure of association and in determining what values should be used to represent each variable for the "clustered" objects. A thorough discussion of cluster analysis techniques is presented by Sneath and Sokal (1973).

The specific methods used in the study reported were initially designed to develop a conceptual classification of Connecticut River Valley landscapes (Palmer and Zube 1976). By that method, the environments to be clustered are simulated by photographic representations. The variable characterizing a particular environment is its judged similarity to each of the other environments. Similarity values are determined by the frequency with which a particular environment is sorted by the respondents into the same pile with each of the other environments.

In cases where all ten respondents sorted two particular photographs together, it is assumed that the photographs represent essentially the same conceptual trail environment. It is necessary to retain only one of these scenes in the subsequent analysis. A similarity matrix can be constructed indicating the frequency with which each unique scene is categorized with every other scene. The data in this similarity matrix are used for the cluster analysis.

RESULTS AND DISCUSSION

Seven distinct types of trail environments were identified by the cluster analysis: rural towns, countryside, vistas, pathways, logging activity, trailside features, and backwoods. This classification might be construed as the "average" sorting formed by the "average" respondent. A characterization of each type of trail environment was obtained through content analysis of the descriptive words and phrases used by respondents to describe their categorizations. Both environmental characteristics and activities described for each category were noted. The most frequently mentioned characteristics and activities for each trail environment type are summarized in table 1.

Conceptual Analysis of Trail Types

Rural towns.--These environments all share features indicating a dominant human presence in the natural environment. Roads, especially when paved, play a particularly important role in the identification of this type. One respondent notes "these environments are for tires, not feet; they make dull walking, both hard and tiring." Residential, commercial, and industrial land uses also characterize this type of environment. This environment was frequently separated into subtypes according to intensity of development. For instance, one respondent formed two distinct piles of rural town environments. He described one as "light rural-character development, trails or dirt roads passing homes, secondary roads, and agriculture." The other he characterized as "moderate to heavy development, from residential to major roads; and little evidence of the natural environment."

While it was generally recognized important services are provided in these environments, the universal opinion was they should be eschewed. "Walk faster and take bigger steps" was one person's reaction. "A real down; it is too much like real life at home."

Countryside.--A wide variety of environments revealed a human presence but were still considered to be appropriate to a hiking experience. Among the countryside type of environments, the most commonly mentioned land uses

Table 1.--Characteristics and activities most frequently used to describe each trail type

Trail type	Rank	Characteristic	Rank	Activity
Rural Towns	1	Human dominance	1	Hurry by
	2	Roads	2	Buy supplies, information
	3	Residential, homes	3	Rest, snack, get warm
	4	Commercial, resort	4	Conflict with cars
Countryside	1	Farmland, open fields	1	Camping, campfire
	2	Lean-tos, camps	2	Change from woods, relief
	3	Water, lake stream	3	Walk fast
	4	Powerlines	4	Eat, drink, rest
	5	Human dominance, overuse	5	Socialize, interest in people
	6	Litter, trash		
Vistas	1	Vista, view	1	Gape, photography
	2	Natural, forested	2	Solitude, peak experience
	3	Ridgetops, high peaks		
Pathways	1	Trail, obvious path	1	Hike through, plod, see trail ahead
	2	Woods, natural	2	Wet boots, circumvent obstacles
	3	Wet, muddy, ways to cross muck	3	Chat, socialize
	4	Excessive wear, erosion, disrepair	4	Study wildlife and vegetation
Logging	1	Logging, timbering	1	Annoyed, ugly, unpleasant
Activity	2	Down trees, slash	2	Hard walking
Trailside	1	Edges, open space	1	Visual enjoyment, expectation
Features	2	Water, streams	2	Rest, eat, drink
	3	Unique things, birch stand	3	Reorient, check progress
	4	Signs	4	Study wildlife, bird watching
			5	Camp
Backwoods	1	Natural, forest	1	Boredom, unable to see
	2	Low visibility, no path	2	Study wildlife, explore
	3	Stone walls, stones, rocks	3	Walk on through
	4	Down trees, logging	4	Hard walking, way-looking
	5	Trail, path		

were agriculture, power line rights-of-way, and bodies of water.

The distinction between the countryside environment and rural towns is not complete. Considerable disagreement existed about whether certain photographs were more similar to the rural town environment or to the countryside. As described by one respondent, countryside environments are "usually encountered coming into or out of towns and near road crossings," and further "woods or country (unpaved) roads are often a pleasant break from deep woods trails and offer a different quality which is usually enjoyable."

Countryside environments play a critical role in the success of a New England backpacking experience. Such environments provide an opportunity for "hikers to pause and enjoy a change from monotonous woods; they might even explore the barn or rest on the bridge encountered along the trail." Another aspect of the countryside environment concerns the more rustic "resting places for the weary hiker which offer a chance to mingle with your fellow hikers, have a campfire, eat, and just plain enjoy the outdoors." The lean-tos and other shelters are apparently appreciated by some but not by others.

Vistas.--Each respondent separated vistas from all other trail environments. These photos depicted sweeping overlooks from ridgetops or high points. They offered a "possibility of real solitude at last and a feeling of personal pride

for having made it," and they enabled one to see the "relationship of the landscape's parts." "You stop, you look, you remember it and think," was one respondent's comment. In the words of another respondent, "high places are often the highlight of a hiker's effort; I feel that looking out over wild areas is more enjoyable than looking out over farm areas although views of these areas can be informative." In any case, vistas provided an opportunity to stop and rest, to eat lunch or pitch camp, and most certainly to take a look around.

Logging activity.--This special condition was clearly identified by half the respondents. To some it included "signs of human technology or specifically timber cutting operations." They felt "such reminders of human incursions into the environment are not pleasant" and wished "economic activity didn't intrude." Another respondent recognized the presence of "logging activity" and realized although "probably most don't like it, I don't mind if it is done right and I find it a good use of resources and a 'natural' activity for people in the environment." On the other hand, some respondents failed to realize logging was taking place and only saw "fallen trees, scrub brush," and "slash." In either case this environment was characterized as "mostly ugly." In response to these conditions they envisioned "walking fast and being annoyed" in part because of the unpleasant scene, but also because "down vegetation makes hiking harder."

Pathways.--In every case respondents formed special piles for "obvious paths through the woods." There was unanimous agreement on what to do when one encountered a path--"Hike!"

Trailside features.--Embedded within the general fabric of the backwoods and pathway environments are features that become important to the hiking experience. One respondent describes them as "unique natural features: open water, a birch stand, a low area which is a major change from the trail's ridge character, or a unique geological formation." It is unlikely that such features need be unique. Rather, they are simply "important changes" from the surrounding trail environments.

Trail features also include way markers serving as places to "stop, look, and listen for information so as not to get lost." One respondent considered these environments as a chance to "check on progress and reorient" oneself.

Backwoods.--By far the most common type of trail environment is simply backwoods. This was not unexpected since the New England landscape is 70 percent forested. As described by one respondent, "typical views, quiet and restful, no sun, cool, no water, and not much wildlife" characterize these environments. As noted by another, the "primary activity would be to notice and study different vegetative species. Few other elements can be seen since they are obstructed by understory growth and vegetation. Any experience would be introspective since one could not relate to any more than a very enclosed environment."

Conceptual Relationships Among Types

The hierarchical nature of the cluster analysis routine used made it useful as a descriptive technique. Specifically, the analysis allowed comparison of relationships between clusters at various levels. Hierarchical relationships can be portrayed as a tree diagram (fig. 1).

After the initial seven trail-environment type clusters are distinguished, the next clustering of types results in four classes. The rural town and countryside types join to form a cluster, perhaps representing "developed landscapes" or areas obviously under human dominance. It is notable that vistas retained their separate identity at this level of generality,

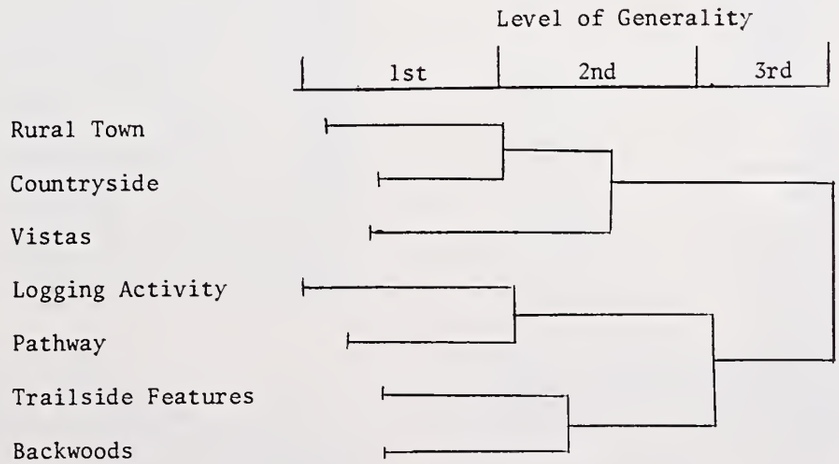

Figure 1.--Tree diagram showing relationships between clusters at three levels.

suggesting that vistas form a more distinct and cohesive category. Logging activities and pathways were joined, probably indicating two different manifestations of human impact within the backwoods environment. Trailside features and backwoods were joined as the fourth class. They seem to be natural environments without any significant human presence.

At the next level the trail environment types are divided into two general classes. One seems to emphasize more natural and the other more human or artificial landscapes. Vistas were joined with rural town and countryside environments to form the class of more human environments. The remaining four types form the group of more natural environments.

Geographic Analysis of Trail Types

One aspect of the sampling strategy employed to inventory the Appalachian Trail for this study involves taking photographs at half-hour intervals of hiking time. This photographic sample can be treated essentially as a random representation of potential scenes experienced on a hike through the study area.

Based on this sample, a reasonable estimate can be made of the frequency with which a hiker might encounter each environment type when hiking through any given area. For example, inspection of table 2 shows that approximately 10 percent of hiking time on the trail is through developed landscapes. Vistas were a relatively rare phenomenon (2%); possibly they are more special because of their rarity. On the other hand, an overwhelming percentage (81) of a hiker's time is spent passing through undifferentiated backwoods.

Table 2.--The distribution of trail environment types[a]

Environment	Frequency	Percent
Rural town	13	7.0
Countryside	7	3.8
Vistas	4	2.1
Logging activity		
Pathway	7	3.8
Trailside features	3	1.6
Backwoods	151	81.2
Unknown[b]	1	.5
Total	186	100.0

[a]These figures are calculated from a systematic sample of randomly photographed scenes taken from the Appalachian Trail in Massachesetts.

[b]This photograph was sampled but not printed. Therefore, it could not be included among the sorted photographs.

The approximate geographic location of each sample in the physiographic inventory can be determined. Further, each photograph can be categorized as an instance of one or another of the seven trail environments identified by the cluster analysis. Therefore, a "map" can be prepared to represent the sequence of conceptual trail-environment types present on a given trail. Figure 2 is an example of such a conceptual "map."

The map portrays the geographic relationships among the various types of environments encountered along the Appalachian Trail in Massachusetts.

In the southern section (Connecticut to Jug End) the most obvious characteristic is the relative lack of backwoods environments. The forest cover is not very dense, and the trail is generally routed along the edge of ridges, affording prolonged exposure to panoramic views. All of the vistas recorded in the photographic sample occur in this section of the trail.

The next section of the trail leads north across the Housatonic River Valley to the Mass Pike Crossing. The presence of agricultural and industrial development indicated by the map probably underestimates the proportion actually found in this area. This is probably due to the tendency of trail managers to favor wooded routes.

Between the Mass Pike and Dalton the trail passes entirely through backwoods environments. No vistas and few other environment types interrupt this stretch of densely wooded area.

The last section of the trail in Massachesetts is popularly considered the most desirable for hiking; it is also the most developed. The trail passes through three towns that are generally consistent with the character of this part of New England. The popularity of this section is indicated by the heavy representation of pathway types. Vistas do occur in this section of the trail, but they are not present in the photosample. This is because the vistas are as fleeting as they are dramatic. This knowlege makes it apparent that the subjectively sampled component of the trail inventory also has an important contribution to make.

CONCLUSION

The procedures developed and illustrated in this study provide one method for obtaining a conceptual classification of trail environments. The results suggest that these environmental types may be influential in determining where and

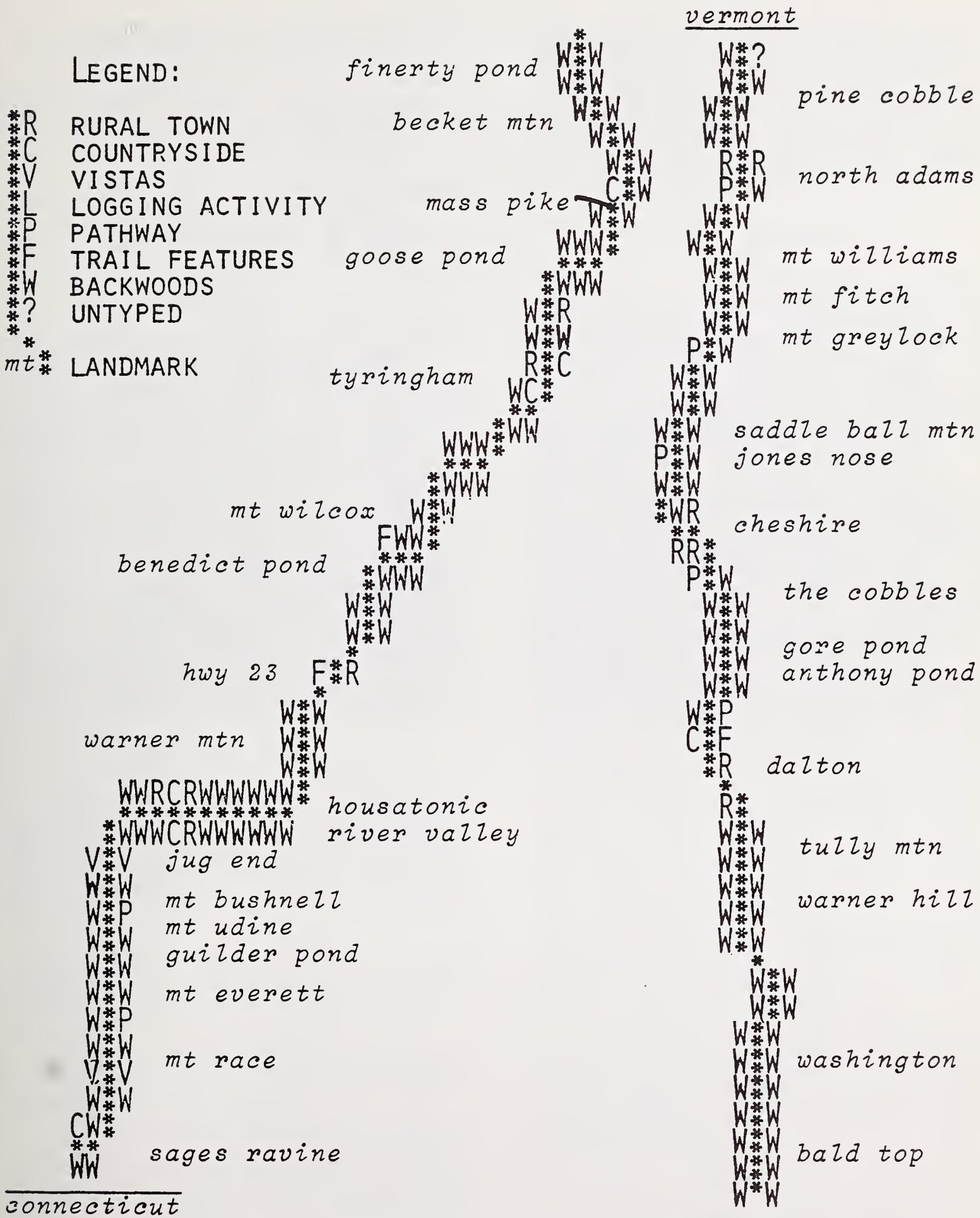

Figure 2.--Conceptual chart of trail environment types.

when various trail activities will occur. The systematic sampling procedure used in this study makes it possible to estimate the relative extent of each trail environment type, as well as its relation to the other types encountered. As the user demand grows for outdoor recreation resources, planners and managers will be particularly in need of methods which provide a generalized geographic inventory of the resource from the point of view of hikers' experiences.

LITERATURE CITED

Bolduc, V. 1973. Backpacking: A pilot study of hikers. Res. Rep. 42. Conn. Agric. Exp. Stn., Storrs.

Clark, R. W. 1977. The Appalachian Trail: An annotated bibliography. Sch. For. and Environ. Stud., Yale Univ., New Haven, Conn.

Hendee, J. C., W. R. Catton, Jr., L. D. Marlow, and C. F. Brockman. 1968. Wilderness users in the Pacific Northwest: Their characteristics, values, and management preferences. USDA For. Serv. Res. Pap. PNW-61. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Holmes, L. L. (ed.). 1972. Guide to the Appalachian Trail in Massachusetts and Connecticut. In The Appalachian Trail Conf. [Harpers Ferry, W. Va.]

Lucas, R. C. 1964. The recreational carrying capacity of the Quetico-Superior area. USDA For. Serv. Res. Pap. LS-15, Lake States For. Exp. Stn., St. Paul, Minn.

Lucas, R. C., and R. P. Rinehart. 1976. The neglected hiker. Backpacker Mag. 4(1).

Marsh, J. S. 1971. Recreation trails in Canada. Counc. of Plan. Libr. Exch. Bibliogr. 175, Monticello, Ill.

Murrary, J. S. 1974. Appalachian Trail users in the southern national forests: Their characteristics, attitudes, and management preferences. USDA For. Serv. Res. Pap. SE-116, Southeast For. Exp. Stn., Asheville, N.C.

Palmer, J. F., and E. H. Zube. 1976. Numerical and perceptual classification. p. 70-142. In Studies in landscape perception, E. H. Zube (ed.) Inst. for Man and Environ., Univ. Mass., Amherst.

Sargent, F. O. 1969. Hiking on Camels Hump. Res. Rep. MP60, Vt. Agric. Exp. Stn., Burlington.

Sneath, P. H. A., and R. R. Sokal. 1973. Numerical taxonomy: The principles and practice of numerical classification. W. H. Freeman and Co., San Francisco.

Stankey, G. H. 1973. Visitor perception of wilderness recreation carrying capacity. USDA For. Serv. Res. Pap. INT-142, Intermt. For. and Range Exp. Stn., Ogden, Utah.

Stankey, G. H., and D. W. Lime. 1973. Recreational carrying capacity: An annotated bibliography. USDA For. Serv. Gen. Tech. Rep. INT-3, Intermt. For. and Range Exp. Stn., Ogden, Utah.

U.S. Congress, Senate Committee on Insular Affairs. 1974. The recreation imperative. Gov. Print. Off., Wash., D.C.

U.S. Department of Interior, National Park Service. 1978. Appalachian Trail management principles (draft). Appalachian Trail Proj. Off., Harpers Ferry, W. Va.

SOME DISPERSED RECREATION EXPERIENCES AND THE RESOURCE SETTINGS IN WHICH THEY OCCUR[1]

Glenn E. Haas, Deborah J. Allen, and Michael J. Manfredo[2]

INTRODUCTION

This paper reports some results from a program of research which is attempting to quantify the reasons why people engage in different outdoor recreation activities[3]. That research has been designed to develop and apply psychometric instruments for identifying and quantifying the psychological outcomes of outdoor recreation participation. These outcomes define the types of satisfaction (preferred or perceived benefits) realized from specific recreation opportunities.

In this paper a brief overview of the conceptual foundation and methods of the research is followed by some results from three studies of wilderness and backcountry recreationists in Colorado. The paper closes with a short discussion of the relevance of the research to recreation resource management. Brief attention is devoted to other studies completed recently or now in progress.

CONCEPTUAL FOUNDATION

Recreation management can be viewed as a production process, with the services produced traditionally referred to as activity opportunities such as hiking, camping, skiing, and fishing. The emerging behavioral approach to recreation management goes further and defines the primary output of that management as satisfying recreation experience opportunities (Driver and Brown 1975). Under this behavioral approach, which guided the research reported in this paper, recreation experiences are further defined in terms of a group of specific psychological outcomes (Driver and Brown 1978). These outcomes have been previously referred to in the literature as a "package of experiences" (Driver and Tocher 1970) and as "multiple satisfactions" (Hendee 1974).

Based upon this behavioral perspective of recreation mangement, Driver and Brown (1978) have conceptualized a "recreation opportunity demand hierarchy" reflecting four types of recreation demand. These demands are for (1) recreation activities, (2) setting attributes, (3) psychological outcomes, and (4) subsequent benefits. Activity opportunities refer to easily identifiable recreation pursuits such as fishing, swimming, and camping. Setting attributes include those of the physical, social, and managerial environment. Physical resource attributes include such features as rugged topography, water, fish, wildlife, and meadows. Social attributes include numbers and kinds of people encountered, litter, and noise. Managerial attributes include entrance fees, information systems, permits, and other tools and techniques of management. Psychological outcomes include opportunities for being together as a family, being with friends, enjoying nature, getting exercise, risk taking, self testing, and realizing a change from everyday life. Subsequent benefits involve both later individual and societal benefits. For example, individuals might improve their mental health, work performance, or family solidarity by engaging in recreation activities. In turn, society might benefit by having a healthier, happier, and more productive population.

The purpose of the studies reported here was to define the users' recreation experiences in terms of psychological outcomes and to identify preferred physical resource attributes of the recreation settings. Particular attention in this paper is directed toward the fish and wildlife resource attributes.

STUDY AREAS

The three Colorado study areas are the Rawah Wilderness, the Flat Tops Wilderness, and

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1/ Paper presented at a workshop on the esthetic value of wildlife at the Ninth Annual Meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 11, 1978.

2/ The authors are Research Associates, Department of Recreation Resources, Colorado State University, Fort Collins.

3/ The research was supported by the McIntire-Stennis Forestry Research Program at Colorado State University and by the Rocky Mountain Forest and Range Experiment Station, USDA Forest Service. That research was supervised by Perry J. Brown and B. L. Driver.

Indian Peaks backcountry area. (Approximately 70,000 acres of the Indian Peaks backcountry area became a part of the National Wilderness Preservation System in September, 1978.) The Rawah Wilderness is a 27,000-acre area 1-1/2 hours driving time west of Fort Collins; the Flat Tops Wilderness is a 235,000-acre area 4 hours driving time west of Denver; and the Indian Peaks backcountry is a 100,000-acre area less than a 1-hour driving time west of Denver and Boulder.

METHODOLOGY

The field methods involved structured and unstructured interviews and observations. Structured interviews took place at trailheads and along roads as people were leaving a study area. These interviews were conducted to collect visitor use information for area managers (activities by zones, number of people per party, major activity participated in, length of participation) and to solicit names and addresses of users for a more detailed questionnaire. All responses were voluntary. Unstructured interviews were conducted on-site by participant observers who talked with users about the high and low points of their trip, their motives for visiting the area, and their perceptions of the area. Observations were also made of user characteristics and behavior.

Shortly after the end of the summer field seasons a mail questionnaire was sent to a subsample of the users who had provided their names and addresses. That questionnaire solicited information on the users' preferences for specific types of psychological outcomes and physical resource attributes. The basic question asked was, how much did each of the outcome or attribute items listed in the questionnaire either add to or detract from the respondent's recreation experience? Respondents rated each item on a nine-point response format which ranged from most strongly added (coded 1) to most strongly detracted (coded 9). In addition, selected socio-economic and demographic information was obtained. Responses to the items on the mailback questionnaire were analyzed using the BC-TRY cluster analysis system (Tryon and Bailey 1970). Cluster analysis permitted the empirical development of outcome domains composed of items logically related to the same theme or value. Individual outcome items can be grouped into scales (sub-domains) and the scales can be combined to form domains. In this research items and domains were considered.

RESULTS

Less than 1 percent of the users contacted at each study location refused to voluntarily provide their names and addresses. The number of returned questionnaires (and response rate) for the 1975 Rawah study was 264 (88%); the 1976 Indian Peaks study was 286 (73%); the 1976 Flat Tops study was 222 (85%). The 1975 Rawah study focused on identifying several psychological outcomes. Eight psychological outcome domains were hypothesized and subsequently empirically identified. The 1976 Indian Peaks study focused only on the three setting attributes described earlier. Nine physical resource attribute domains were hypothesized and subsequently empirically identified. The 1976 Flat Tops study dealt with both psychological outcomes and resource attributes. The eight psychological outcome domains and nine resource attribute domains identified in the previous studies were used in the Flat Tops study, but only seven psychological outcomes and eight resource attributes were reliably identified. From this discrepancy, it might be inferred that one psychological outcome domain and one resource attribute domain were either not relevant to Flat Tops users or that the items in the domains need further refinement. In subsequent studies, acceptable reliability coefficients have been obtained for the "escape pressures" domain by further scale refinement.

Psychological Outcomes

The empirically identified and reliable psychological outcome domains are listed in table 1 along with their mean values, a verbal description of the extent to which they were perceived to contribute to satisfaction, and their alpha reliability coefficients. The "escape pressures" domain had a very low reliability coefficient in the Flat Tops study and was omitted as a psychological outcome domain in that study. The remaining domains all had alpha reliability coefficients above 0.60, which was deemed acceptable.

The rank ordered mean responses to the outcome domains were similar for the two areas. "Relationships with nature" was scored as strongly adding to satisfaction by users of both areas. In the Rawah study, "escape pressures" was also scored as strongly adding to satisfaction. "Achievement," "autonomy," and "reflection on personal values" were scored as moderately adding to satisfaction of users in both areas. "Recollection/sharing" moderately added to satisfaction of Rawah users and only slightly added to satisfaction of Flat Tops users. "Risk taking" and "meeting/observing other people" were scored as neutral, neither adding to nor detracting from satisfaction of users in both areas.

Physical Setting Attributes

The empirically identified and reliable setting attribute domains are listed in table 2 along with their mean values, a verbal description of the extent to which they were perceived to contribute to satisfaction, and their alpha reliability coefficients. The "nuisances" domain had a very low reliability coefficient in the Flat Tops study and was omitted as a setting attribute domain in that study. The remaining domains all had alpha reliability coefficients above 0.60, which was deemed acceptable.

Table 1.--Psychological outcome domains identified for 1975 Rawah Wilderness users and 1976 Flat Tops Wilderness users

Psychological outcome domains	Study area			
	Rawah Wilderness		Flat Tops Wilderness	
	Mean[a]	Verbal description	Mean[a]	Verbal description
Relationships with nature 0.87/0.89[b]	1.9	Strongly added	1.9	Strongly added
Escape pressures 0.79/	2.1	Strongly added	c	c
Achievement 0.91/0.81	2.5	Moderately added	2.8	Moderately added
Autonomy 0.83/0.78	2.6	Moderately added	2.7	Moderately added
Reflection on personal values 0.84/0.82	2.9	Moderately added	3.1	Moderately added
Recollection/sharing 0.80/0.82	3.1	Moderately added	3.6	Slightly added
Risk taking 0.81/0.69	4.9	Neither added nor detracted	4.9	Neither added nor detracted
Meeting/observing other people 0.83/0.86	4.9	Neither added nor detracted	5.1	Neither added nor detracted

[a]Means were computed from responses to a response format on which most strongly added was coded 1 and most strongly detracted was coded 9.

[b]Reliability coefficients for the domains in the Rawah and Flat Tops studies, respectively.

[c]The escape pressures outcome domain was not reliably identified in the Flat Tops Wilderness study.

The major similarities in the two studies were (1) the same three setting attribute domains were perceived as contributing the most to satisfaction, (2) the "dense vegetation," "rugged topography," and "unique natural feature" domains had virtually identical means, and (3) "man-made intrusions" detracted from satisfaction. The major dissimilarities were (1) the Flat Tops users placed greater importance on the wildlife and fish-related physical resource attribute domains than did the Indian Peaks users, and (2) the Flat Tops users reported that man-made intrusions reduced their satisfaction more than was reported by Indian Peaks users.

Table 3 gives the means of the "fish-related" and "wildlife" physical resource attribute items for the Indian Peaks and Flat Tops studies. These items were perceived either to add strongly or moderately to the user's recreation satisfaction.

Indian Peaks users indicated that "wildlife" contributed more positively to their recreation experience than did the "fish-related" item. The overall mean for the "wildlife" domain was 2.4 (strongly added to satisfaction) while the mean for the "fish-related" domain was 3.2 (moderately added to satisfaction). The Flat Tops users scored items in both domains similarly and more positively than did the Indian Peaks users. The overall mean for the "wildlife" domain was 1.8 while the mean for the "fish related" domain was 2.0 (both strongly added to satisfaction).

Table 2.--Setting attribute domains identified for 1976 Indian Peaks users and 1976 Flat Tops Wilderness users

Resource attribute domains	Study area			
	Indian Peaks Backcountry		Flat Tops Wilderness	
	Mean[a]	Verbal description	Mean[a]	Verbal description
Meadows/forest 0.83/0.90[b]	1.9	Strongly added	1.6	Strongly added
Water-related 0.85/0.87	2.1	Strongly added	1.7	Strongly added
Wildlife 0.89/0.92	2.5	Strongly added	1.8	Strongly added
Dense vegetation 0.79/0.83	2.6	Moderately added	2.7	Moderately added
Rugged topography 0.93/0.94	2.7	Moderately added	2.7	Moderately added
Unique natural features 0.92/0.93	2.9	Moderately added	2.7	Moderately added
Fish-related 0.93/0.87	3.2	Moderately added	2.0	Strongly added
Nuisances 0.77/	5.4	Neither added nor detracted	c	c
Man-made intrusions 0.77/0.69	5.8	Slightly detracted	7.0	Moderately detracted

[a]Means were computed from responses to a response format on which most strongly added was coded 1 and most strongly detracted was coded 9.

[b]Reliability coefficients for the domains in the Indian Peaks and Flat Tops Wilderness studies, respectively.

[c]The nuisances resource attribute domain was not reliably identified in Flat Tops Wilderness study.

That the "wildlife" and "fish-related" domains were perceived more important to the Flat Tops Wilderness users might be attributed to differences in user and area characteristics. Many of the Indian Peaks visitors live in the Denver metropolitan area, visit the area with their families as day-users, and participate in activities such as hiking, walking, auto driving, and fishing. Visitors to the Flat Tops Wilderness, in comparison, are less often accompanied by children and participate in activities such as hiking, backcountry camping, fishing, and photography.

The differences in wildlife and fish attribute scores might be explained by user expectations for each area. Wildlife and fish are much more abundant in the Flat Tops Wilderness. It is widely recognized for its quality fishing and big game resource.

CONCLUSIONS

Several inferences can be made from the studies reported. First, preferred recreation experiences can be defined by specific psychological

Table 3.--Means of the fish and wildlife resource attribute items for 1976 Indian Peaks backcountry users and 1976 Flat Tops Wilderness users

Resource attribute domains	Study area: Indian Peaks Backcountry		Study area: Flat Tops Wilderness	
	Item	Mean[a]	Item	Mean[a]
Fish-related	Brown trout	3.27	Brown trout	2.09
	Cutthroat trout	3.33	Cutthroat trout	1.69
	Brook trout	3.01	Brook trout	1.82
	Rainbow trout	3.11	Rainbow trout	2.00
	Grayling	3.19	Grayling	2.61
	Slow moving streams with deep holes	2.99	Slow moving streams with deep holes	1.98
	Naturally reproducing fish populations	3.04	Naturally reproducing fish populations	1.75
	Stocked fish	3.69		
Wildlife	Ptarmigan	2.56	Ptarmigan	1.98
	Grouse	2.71	Grouse	1.98
	Song birds	2.29	Song birds	1.82
	Predatory birds	2.50	Predatory birds	1.88
	Small furbearers	2.49	Small furbearers	2.00
	Squirrels	2.70	Squirrels	2.19
	Elk	2.34	Elk	1.40
	Mule deer	2.57	Mule deer	1.70
	Big horn sheep	2.20	Big horn sheep	1.57

[a]Means were computed from responses to a response format on which most strongly added was coded 1 and most strongly detracted was coded 9.

outcomes. Second, preferences for these outcomes can vary among the recreationists visiting an area. For example, the "relationships with nature" outcome domain contributed more to user satisfaction than did the "risk taking" and "meeting/observing other people" outcome domains in both the Rawah and Flat Tops studies.

Third, the preference by Rawah and Flat Tops users was nearly the same for several outcome domains. Means for "relationships with nature," "autonomy," "risk taking," and "meeting/observing other people" differed by less than 0.2, suggesting that there might be some substitutability among different areas in providing the same kinds of satisfaction.

Fourth, the previous inferences apply to setting attributes. That is, these results suggest that (1) settings can be identified; (2) preferences for these settings can vary among the recreationists visiting an area; and (3) preferences for several setting attributes can be the same across areas.

This type of research has numerous recreation planning and management implications. It aids in defining the preferred outputs of recreation management (recreation experience opportunities). It also aids in identifying the recreational settings preferred by recreationists. Planners and managers can use this information in resource inventory and classification, resource allocation, development of management objectives, selection of management tools and techniques, and evaluation and modification of the recreation system.

Cooperative backcountry and wilderness research has continued between Colorado State University and Rocky Mountain Station to validate the empirically identified psychological outcomes and setting attributes, to identify other outcomes and resource attributes of value to people, to identify types of people demanding specific psychological outcomes, and to relate these specific outcomes to attributes of the physical, social, and managerial setting. Study areas have included the Weminuche, Eagles Nest, and Rawah Wildernesses in Colorado (USDA FS); the Arkansas

River Canyon in Colorado (BLM); the Little Sahara recreation area in Utah (BLM), the Oak Creek Canyon recreation complex in Arizona (USDA FS); and the Popo Agie Primitive Area and Fitzpatrick Wilderness in Wyoming (USDA FS).

A major activity for the next few years will be participating in management-research demonstration projects. One such project is underway for the Maroon Bells-Snowmass Wilderness and its contiguous backcountry between Aspen and Crested Butte, Colo. That project is designed to test the relevancy and applicability of inventory and planning information and tools developed by the research program described in this paper in an actual planning and management situation.

LITERATURE CITED

Driver, B. L., and Perry J. Brown. 1975. A social-psychological definition of recreation demand, with implications for recreation resource planning. p. 63-88. In Assessing demand for outdoor recreation, Nat. Res. Counc. Comm. Assess. Demand Unnumb. Rep., 123 p. Wash., D.C.

Driver, B. L., and Perry J. Brown. 1978. The opportunity spectrum concept and behavioral information in outdoor recreation resource supply inventories: A rationale. p. 24-31. In Integrated inventories of renewable natural resources: Proc. of the workshop. [Jan. 8-12, 1978, Tucson, Ariz.] Gyde H. Lund and others (tech. coord.), USDA For. Serv. Gen. Tech. Rep.RM-55, 482 p., Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Driver, B. L., and S. R. Tocher. 1970. Toward a behavioral interpretation of recreational engagements, with implications for planning. p. 9-31. In Elements of outdoor recreation planning, B. L. Driver (ed.) Univ. Microfilms, Ann Arbor, Mich.

Hendee, J. C. 1974. A multiple-satisfaction approach to game management. Wildl. Soc. Bull. 2(3):104-113.

Tyron, R. C., and D. E. Bailey. 1970. Cluster analysis. 347 p. McGraw-Hill Book Co., New York.

CURRENT RESEARCH ON ESTHETIC VALUES OF WILDLIFE[1]

William W. Shaw[2]

The principle directions of research on perceived values of wildlife have been and continue to be largely framed by immediate needs of wildlife resource managers. Traditionally, most wildlife management has been oriented toward producing harvestable surpluses of game species, and most socio-psychological research has involved the principle benefactors of this management--sport hunters. The studies of hunters are too numerous to list. Hendee and Potter (1976) summarized 33, and there have been several since that time. Most of these studies have produced basic socio-demographic descriptive information, although a growing number have dealt with perception, motivation, and other behavioral information.

In recent years, however, it has become apparent that sportsmen are no longer the only major interest group actively concerned with wildlife management policies. Memberships in animal oriented organizations of all types ranging from groups which actively oppose hunting to general conservation groups has burgeoned (Witter 1976). Sales of birdseed have risen 5 - 10 percent annually since 1960 (Wildlife Management Institute 1975) and as many as 20 percent of American households feed wild birds (Payne and DeGraaf 1975). A recent national survey estimated that over 49 million Americans participated in some form of wildlife observation in 1976 (United States Department of Interior 1975). These studies are part of the growing body of evidence indicating nonhunting values of wildlife are very significant for many Americans.

These developments have profound implications for the wildlife manager, who typically works within governmental agencies and is charged with managing a resource which by law is publicly owned. One of the most pressing needs is for an understanding of such basic questions as: Who, in addition to hunters, cares about wildlife? What segments of the public are concerned? How much do they care? About what aspects of wildlife management are they concerned? What kinds of financial mechanisms would they support to supplement the revenue for wildlife management which presently comes primarily from hunters? All of these are pressing questions which must be dealt with if resource managers are to serve the best interests of the public.

This paper will trace a sequence of studies attempting to answer some of these questions. The author will then discuss some observations regarding the state of our knowledge about perceptions of wildlife and directions for future research.

CRITICS OF WILDLIFE MANAGEMENT

Understanding the critics as well as supporters of existing management policies is crucial for management agencies which must deal with public pressure groups. One recent study compared the backgrounds and beliefs of members of three wildlife interest groups: Michigan deer hunters, Michigan Audubon Society members (a group which neither supports nor opposes hunting), and Michigan supporters of the Fund for Animals, Inc. (a nationally prominent, anti-hunting organization). Using a survey technique, a variety of differences were revealed among these three groups (Shaw 1975, 1977). However, related to the issue of perceived values of wildlife, the similarities between these groups were more significant than the contrasts. In spite of basic philosophical differences between hunting advocates and hunting opponents there was very close agreement on the questions dealing with values of wildlife and threats to wildlife (tables 1 and 2). Since this study, several others have produced similar results (Arthur et al. 1977, Shaw et al. 1978, Witter 1978). Whenever wildlife enthusiasts have been studied, regardless of their sentiments on the volatile issue of hunting, esthetic, and existence values have been rated as the most important values of wildlife and loss of habitat as the most significant threat to wildlife.

Results from these studies suggest two important things for resource managers. First of all, opposition to hunting appears not to be simply an artifact of biological misunderstanding which might be eliminated through effective information and education programs. On the contrary, this sentiment often has deep-seated philosophical origins largely outside the realm of influence of wildlife managers. Consequently,

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1/ Paper presented at a workshop on the esthetic value of wildlife at the ninth annual meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 11, 1978.

2/ The author is Assistant Professor, School of Renewable Natural Resources, University of Arizona, Tucson.

Table 1.--Group means and rankings for reasons wildlife are considered important

Scale: 1 = "extremely important"
5 = "not important"

Reasons	Group means (and ranks)		
	Hunters	Audobon	Fund for Animals
They are part of the ecological balance upon which we are all dependent.	1.60(2)	1.17(1)	1.15(1)
People enjoy viewing wildlife	1.53(1)	1.67(2)	1.63(2)
People enjoy just knowing that they exist.	2.01(3)	2.09(3)	1.70(3)
They are of scientific value.	2.31(5)	2.31(4)	3.10(6)
They play an important part in our cultural heritage (songs, legends, etc.)	2.57(6)	2.54(5)	2.49(4)
They provide hunting recreation.	2.14(4)	3.79(7)	4.85(9)
They help the economy by attracting tourism.	2.72(8)	3.20(6)	3.71(7)
They are a source of food and furs.	2.59(7)	3.80(8)	4.61(8)
Animals may have souls like humans.	3.61(9)	4.04(9)	2.66(5)

Table 2.--Group means and rankings for threats to wildlife

Scale: 1 = "extremely serious"
5 = "not serious"

Threats	Group means (and ranks)		
	Hunters	Audubon	Fund for animals
Loss of habitat due to human developments	1.16(1)	1.22(1)	1.14(1)
Pollution	1.71(2)	1.38(2)	1.32(3)
Illegal hunting	2.12(3)	1.96(4)	1.31(2)
All terrain vehicles (snowmobiles, jeeps, etc.)	3.14(5)	1.92(3)	1.76(6)
Unsound wildlife management practices	2.34(4)	2.30(5)	1.52(5)
Commercial trapping	3.20(6)	2.83(6)	1.41(4)
Legal sport hunting	4.39(8)	3.54(7)	1.89(7)
Predation by other animals	4.31(7)	4.56(8)	4.33(8)

the efforts of wildlife professionals concerned with maintaining and building public support for their activities would be best spent in emphasizing areas in which their activities benefit all types of wildlife enthusiasts, whether hunters or not. Secondly, these results suggest a basis for cooperation among disparate wildlife interest groups on certain very critical wildlife management issues. Although opposed to hunting for philosophical reasons, the members of this anti-hunting group did not see hunting as a major threat to wildlife. Furthermore, the proponents of hunting appear to be largely in agreement with hunting opponents and other wildlife enthusiasts concerning the major values of wildlife.

NONHUNTING WILDLIFE ENTHUSIASTS

If there is a large and perhaps growing segment of the public that is very concerned with the welfare of wildlife but does not hunt, who are they? Our understanding of the feelings of the general public concerning wildlife is still very limited with only a few national studies having looked at these issues (Kellert 1976, 1978; Arthur et al. 1977; Shaw et al. 1978).

One initial approach to understanding how nonhunting wildlife enthusiasts value wildlife is to study those individuals who actively engage in nonconsumptive wildlife pursuits such as bird-watching. Admittedly this is a very specific group and does not include many people who may care about wildlife but do not actively attempt to view wildlife as a primary recreational pursuit. It is, however, a logical starting point because these are people who are directly affected by wildlife management policies.

To do this, 591 wildlife enthusiasts visiting selected prominent bird watching sites in southeastern Arizona were surveyed in 1977 (Shaw et al. 1978; Witter et al. 1978). This study provided a basic socio-demographic description of nonhunting wildlife enthusiasts visiting these sites. In addition, a number of items dealing with perceptions of wildlife values and wildlife management priorities were included. As in other studies of wildlife interest groups, esthetic and existence values of wildlife were more important than other possible wildlife values to these individuals (table 3). In general, they felt that wildlife management presently benefits mostly hunters and that wildlife management priorities

Table 3.--Values of wildlife rated by 591 visitors to selected bird watching sites in southeastern Arizona

Scale: 0 = not valuable at all to you personally
10 = extremely valuable to you personally

How valuable is it that wildlife...	Mean value
1. Are factors in nature's balance	9.5
2. Are indicators of environmental health of the world	8.8
3. Teach people about nature	8.7
4. Help maintain the human bond with nature	8.7
5. Are simply existing in the wild	8.5
6. Are sources of excitement in life	8.1
7. Are reasons to get out-of-doors for awhile	8.0
8. Are reasons to get-away-from-it-all for awhile	8.0
9. Are spiritually uplifting	7.8
10. Are photographic subjects	6.6
11. Are subjects to be sighted and listed in a wildlife diary	6.5
12. Bring people together in fellowship	6.2
13. Are subjects for scientific study	6.0
14. Are sources of stories to tell others	5.4
15. Are subjects for art work	4.9
16. Are subjects for medical research	3.1
17. Are subjects for viewing in zoos	3.0
18. Are feather sources (goose and duck down)	1.6
19. Are meat sources	1.0
20. Are subjects to be hunted	0.8
21. Are pets	0.7
22. Are circus performers	0.7
23. Are fur and leather sources	0.5
24. Are raw materials for fashion industry	0.2
25. Are trophy sources (antlers, head, or body mounts)	0.2

favor hunting interests over nonconsumptive interests. Interestingly, although these people do not actively support wildlife management agencies, they do not actively oppose them. They tend to see hunting as a legitimate activity and wildlife management as primarily oriented toward serving these interests. In summary, they are basically nonaligned on the hunting issue and prefer to support private wildlife conservation organizations rather then governmental agencies. Importantly, these people are very much in favor of any proposals to promote cooperation between hunting and nonhunting concerns in the interest of wildlife welfare.

These individuals, who actively pursue nonconsumptive uses of wildlife, place a very high esthetic value on wildlife and behave accordingly. Over 50 percent indicated that wildlife appreciation was their most enjoyable outdoor recreational activity, and 79 percent listed it as one of their three most enjoyable activities. They considered wildlife habitat preservation as a top concern among environmental issues and environmental quality as a top concern among broad social issues (health care, national defense, etc.). These findings were supported in a related study that compared the beliefs and attitudes of members from three national organizations: Ducks Unlimited, Inc. (hunters), The Wildlife Society (professional wildlife managers), and American Birding Association (avid birdwatchers) (Witter 1978).

Active nonhunting wildlife enthusiasts are individuals who care a great deal about wildlife and perceive wildlife esthetics as a major aspect of their lives. And yet, these are individuals whose concerns and activities are almost entirely outside the domain of most wildlife management that occurs within public resource management agencies. In order to serve the best interest of the entire public and enlist the broadest possible support for wildlife conservation agencies, it behooves natural resource managers to attempt to understand and work with these nonhunting wildlife enthusiasts.

FUTURE RESEARCH NEEDS

In many ways, research on the esthetic values of wildlife is only beginning. More[3] conducted a comprehensive review of the literature dealing with nonconsumptive uses of wildlife and concluded research is in a transition between asking "how much" and "who participates." There exists a need to go beyond the role of describing individuals in a traditional socio-demographic sense and study motivations and perceptions relating to wildlife appreciation. Sampling designs need to be improved so inferences can be drawn beyond the actual study populations. Detailed studies of the general public and its perceptions of wildlife are needed although some research of this nature is currently underway. Much can be done and needs to be done to refine and improve methodologies for studying wildlife esthetic values, and the validity of these methods needs to be examined by using different methodologies and examining behavioral correlates with research findings. Shaw and King[4] have one attempt currently underway to measure values of wildlife using two basically different approaches. One is the socio-psychological approach using self-reported importance scales, memberships in wildlife organizations, wildlife-related recreational pursuits, etc. as measures of importance. The second is an economic approach based on human allocation of resources (time and money, etc.) for wildlife appreciation. The validity of various techniques for assessing esthetic values can be determined by simultaneously using several different approaches.

Considerable progress has been made in developing techniques for measuring landscape and forest esthetics, and some of these methods may be applicable to studies of wildlife esthetics. Particularly valuable are some of the rigorous experimental designs used in these areas of esthetic research. Researchers would be well advised, however, to recognize certain unique aspects of wildlife esthetics. Esthetic values entail two basic human domains. One is perception of the stimuli. The second is the cognitive processes whereby we attribute values to the objects or stimuli. In most (if not all) situations, both of these factors are involved. However, in the case of wildlife, the cognitive element appears to be particularly significant. For many people, wildlife are symbolic of environmental quality and man's relationship to nature. Furthermore, a strong tendency to project human feelings or anthropomorphize when thinking about animals undoubtedly influences esthetic perception. Our greatest needs for research on wildlife esthetics are in understanding the complex relationships among experiences, attitudes, and beliefs which intervene between perception of wildlife stimuli and the attribution of esthetic value to wildlife.

LITERATURE CITED

Arthur, Louise M., Russell Gum, Edwin H. Carpenter, and William W. Shaw. 1977. Predator control: The public viewpoint. Trans. 42nd North Am. Wildl. and Nat. Resour. Conf. 42:137-145.

3/ More, Thomas A. 1978. The demand for nonconsumptive wildlife uses: a literature review. Unpublished review draft.

4/ Shaw, William W., and David A. King. 1976. Nonconsumptive uses and values of wildlife at selected locations in southern Arizona. Unpublished research proposal. Univ. Ariz. School of Renewable Natural Resources.

Hendee, John C., and Dale R. Potter. 1975. Hunters and hunting: Management implications of research. p. 137-161. In South. States Recreation Res. Appl. Workshop Proc. USDA For. Serv. Gen. Tech. Rep. SE-9, Southeast. For. and Range Exp. Stn., Asheville, N.C.

Kellert, Stephen R. 1976. Perceptions of animals in American society. Trans. 41st North Am. Wildl. and Nat. Resour. Conf. 41:533-546.

Kellert, Stephen R. 1978. Attitudes and characteristics of hunters and anti-hunters and related policy suggestions. Trans. 43rd North Am. Wildl. and Nat. Resour. Conf.

Payne, Brian R., and Richard M. DeGraaf. 1975. Economic values and recreational trends associated with human enjoyment of nongame birds. p. 6-10. In Proc. symp. on manage. for. and range habitats nongame birds. USDA For. Serv. Gen. Tech. Rep. WO-1, U.S. Dep. Agric., For. Serv., Washington, D.C.

Shaw, William W. 1975. Attitudes toward hunting. Wildl. Div. Rep. 2740, 84 p. Mich. Dep. Nat. Resour.

Shaw, William W. 1977. A survey of hunting opponents. Wildl. Soc. Bull. 5(1):19-24.

Shaw, William W., Daniel J. Witter, David A. King, and Merton T. Richards. 1978. Nonhunting wildlife enthusiasts and wildlife management. Trans. West. Assoc. Fish and Wildl. Agencies.

U.S. Department of Interior, Fish and Wildlife Service. 1977. 1975 National survey of hunting, fishing, and wildlife associated recreation. 100 p. U.S. Dep. Inter., Fish and Wildl. Serv., Washington, D.C.

Wildlife Management Institute. 1975. Current investments, projected needs, and potential new sources of income for nongame fish and wildlife programs in the United States. 77 p. Wildl. Manage. Inst., Washington, D.C.

Witter, Daniel J. 1976. Man's feelings toward animals and their uses: A source book of literature citations and animal welfare organization data. Working Pap. 16, 86 p. U.S. Dep. Agric., Econ. Res. Serv.

Witter, Daniel J. 1978. Bird-watchers', hunters', and wildlife professionals' beliefs about the importance and management of wildlife. Ph.D. diss., Sch. Renewable Nat. Resour., Univ. Ariz., Tucson.

Witter, Daniel J., William W. Shaw, David A. King, and Merton T. Richards. 1978. Nonconsumptive wildlife enthusiasts visiting southern Arizona: Their beliefs about wildlife management programs and policies. Trans. Ariz.-N. Mex., Sec. Meet., Wildl. Soc. [Feb. 1978].

THE ESTHETIC VALUE OF WILDLIFE: PERCEPTIONS OF THE AMERICAN PUBLIC AND SPORTSMEN[1]

Louise M. Arthur[2]

Wildlife management has long been recognized as requiring at least as much effort directed toward the management of people as of wildlife itself (Murie 1954, Bean 1977). Similarly, the goals of wildlife management have been defined in terms of human need, particularly the needs of hunters and fishermen. This focus on sportsmen's needs is at least partially based on their providing the bulk of current revenues for wildlife management, up to 80 percent by some estimates (Hendee and Potter 1975).

Although there has been a shift from the earlier "game bagged" objective of wildlife management to a "man-days afield" one, even the latter objective is directed at the so-called "consumptive" uses of wildlife. Only recently have nonconsumptive values such as ecological, existence, and esthetic values of wildlife begun to receive significant attention. With the recognition of these nonconsumptive values has come recognition of the desires of nonconsumptive users, of nature lovers, bird watchers, and other members of the nonhunting public who may enjoy wildlife if only vicariously.

Some of this increasing attention to the desires of nonsportsmen may stem from financial concerns; if game populations continue to decline, a greater proportion of wildlife management funding will have to be obtained from nonconsumptive sources. The rapid increases in the number of people actively involved in wildlife protection groups (Witter 1977) and the environmental sensitivity of the general public have also contributed to the redefinition of wildlife management objectives to incorporate the expressed interests of both active sportsmen and nonsportsmen.

The concerns of the vocal environmental interests may not, however, directly represent more general public concerns. Furthermore, the current emphasis of wildlife management on assuring sportsmen some minimal degree of hunting and fishing success may not accurately reflect the desires and perceptions of sportsmen; there are some indications that sportsmen are more interested in experiencing the natural environment, enjoying companionship, and escaping home problems than in bagging a limit of game (Knopf et al. 1973, More 1973, Potter et al. 1973). In order to obtain an accurate indication of the esthetic value of wildlife relative to other values such as hunting pleasure, food, and fur, a series of surveys of American sportsmen and the general public was conducted by the U.S. Fish and Wildlife Service and the U.S. Department of Agriculture. Two of the surveys were extensive telephone surveys of random samples of American households (see Arthur et al. 1977 and U.S. Fish and Wildlife Service 1977). The other two were more intensive and pervasive mail surveys of American hunters and fishermen (U.S. Fish and Wildlife Service 1977) and purchasers of duck stamps.[3]

ATTITUDES OF THE GENERAL PUBLIC

The results of the two surveys of general public perceptions and uses of wildlife indicated a wildlife policy directed toward providing game animals is not consistent with general public interests. In a joint U.S. Department of Agriculture-Fish and Wildlife Service Study conducted in May-June 1976, 2460 respondents (78% response rate) were asked to rate the importance of several aspects of wildlife on a 0-10 scale, where 0 indicated no importance and 10 indicated extreme importance. For the exact wording of this and other items write: Environmental Economic Studies, Economics, Statistics, and Cooperatives Service, Room 420, GHI Building, U.S. Department of Agriculture, Washington, D.C. 20250. The results are shown in the following tabulation:

1/ Paper presented at a workshop on the esthetic value of wildlife at the Ninth Annual Meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 11, 1978.

2/ The author is a Social Science Research Analyst with the Economics, Statistics and Cooperative Services of the U. S. Department of Agriculture, Tucson, Ariz.

3/ Arthur, Louise M. 1978. Attitudes toward wildlife management: a study of hunters and fishermen in the U.S. U.S. Fish and Wildl. Rep., in progress.

Importance of various aspects of wildlife.

Aspects	Mean points
Ecological value	8.9
Existence value	8.6
Viewing pleasure	8.3
Food source	4.8
Hunting opportunity	3.8
Fur source	2.5

When respondents were asked to divide 100 points among three aspects--hunting opportunity, existence value, and viewing pleasure--to reflect their relative enjoyment of each, the distinction was dramatic:

Relative enjoyment of three aspects of wildlife.

Aspects	Mean points
Viewing pleasure	52
Existence value	37
Hunting opportunity	10
TOTAL	99

Thus, viewing wildlife (defined as "in person or in pictures") was more important to the respondents than hunting. Furthermore, no significant difference was found between the importance ratings assigned to viewing pleasure by prohunters and anti-hunters ($F=0.41$, $p<0.5$); both groups rated viewing pleasure over 8. Hunting opportunity, on the other hand, received a mean rating of only 5.6 from the 55 percent of the sample which approved of hunting and a rating of 1.8 from anti-hunters.

A 1975 U.S. Fish and Wildlife Service survey of 106,294 households and over 300,000 individuals suggested much of this viewing pleasure is either unplanned or vicariously accrued via printed pictures, television, or movies, for instance. Extrapolations indicated that of 184.3 million Americans over 9 years of age, only 49.3 million took special trips for wildlife observation and only 15 million photographed wildlife. Some 74.5 million hunted or fished. In addition, nearly half of the participants in wildlife observation and more than half of the wildlife photographers were also hunters and fishermen.

ATTITUDES OF HUNTERS AND FISHERMEN

The 1975 U.S. Fish and Wildlife Service mail survey of 3,500 waterfowl hunters again indicated aspects of wildlife experiences other than the killing of game predominate in determining levels of user satisfaction. A cluster analysis of responses to the 1975 Waterfowl Survey revealed only a small proportion of success-oriented hunters (17%). Nevertheless, even 70 percent of this group judged experiencing nature's beauty as more important than bagging a limit. Across all respondents, experiencing the wildlife environment was the most important motive for hunting and the most important factor in the enjoyment of hunting. Almost 90 percent of waterfowl hunters took special trips outside the hunting season to view waterfowl.

Similar motives have been identified in fishermen. Although the 1975 U.S. Fish and Wildlife Service survey of over 20,000 hunters and fishermen did not focus on many of the non-success benefits of hunting and fishing, the responses to warmwater fishing issues listed in the following tabulation suggest that some of the most important aspects of the fishing experience are related to esthetic qualities of the wildlife environment:

Percent selection as one of three most serious threats to the quality of warmwater fishing

Threats	Percent
Water pollution	88.3
Conflict with boats	48.1
Habitat destruction	42.9
Poor land management	36.5
Restricted access	27.1
Too many fishermen	23.4
Illegal fishing	19.6

The exact wording for this and other items are available in Arthur.[3] Knopf et al. (1973) have found fishermen are primarily motivated by desires to experience natural settings, display skills, and escape various personal problems.

CONCLUSIONS

The ratings in the first two tabulations suggest survey respondents valued esthetic aspects of wildlife more than any direct consumptive use. Thus, wildlife management policy designed primarily to enhance hunting opportunity would likely be suboptimal from a public perspective. The intensive surveys of sportsmen's attitudes on various aspects of the total wildlife experience revealed that such a policy might also be suboptimal from the sportsman's point of view. The most important determinant of hunters' and fishermen's satisfactions seemed to be related to experiencing the esthetic aspects of the wildlife environment.

These results[3] suggest that sportsmen would willingly consider trading lower bag limits or creels and higher user fees for the continued opportunity to enjoy a quality wildlife environment. Some of the more obvious ramifications of this willingness to pay a higher per animal cost for external benefits would include the ability to generate additional revenues through increased user fees and the use of these additional revenues for enhancing various aspects of the wildlife

environment other than sizes of or access to wildlife populations.

Sportsmen's interests are, in general, congruent with public interests. Both are concerned with protecting wildlife habitats and providing wildlife sanctuaries, not for the sole purpose of assuring supplies of game for hunters, but, for instance, to assure the existence of various species, to introduce species into new regions, and to provide viewing pleasure. Even when success could be more easily assured, as through the stocking of fish, factors of wildlife management dealing with the environment surrounding wildlife experiences were judged more important than success.[3]

Thus, wildlife resources may not be measured properly in terms of hunting and fishing success rates, days afield, or perhaps even number of animals or species. More important is insuring the quality of the natural habitats of wildlife, providing quality experiences for man in these habitat environments, protecting wildlife so people will know they are being protected, and providing ample visual opportunities for naturalistic and vicarious observers. For instance, crowding was considered a major detraction from quality wildlife experiences, with the exception of warmwater fishing.[3] The importance of management for esthetic, nonconsumptive goals will likely continue to increase with the decline in hunter success (Stankey et al. 1973), the growth in urbanization (Kennedy 1973), and the increase in environmental sensitivity of the public.

LITERATURE CITED

Arthur, Louise M., Russell L. Gum, Edwin H. Carpenter, and William W. Shaw. 1977. Predator control: The public viewpoint. Trans. 42nd North Am. Wildl. and Nat. Resour. Conf. 42:137-145.

Bean, Michael J. 1977. The evaluation of national wildlife law. 485 p. U.S. Gov. Print. Off., Washington, D.C. 485p.

Hendee, John C., and Dale R. Potter. 1975. Hunters and hunting: Management implications of research. p. 137-161. In South. states recreation res. appl. workshop proc. USDA For. Serv. Gen. Tech. Rep. SE-9, Southeast. For. and Range Exp. Stn., Asheville, N.C.

Kennedy, James J. 1973. Some effects of urbanization on big and small game management. p. 90-97. In Human dimensions of wildlife programs, John C. Hendee and Clay Schoenfeld (eds.) Mercury Press, Rockville, Md.

Knopf, Richard C., B. L. Driver, and John R. Bassett. 1973. Motivations for fishing. p. 28-41. In Human dimensions of wildlife programs, John C. Hendee and Clay Schoenfeld (eds.) Mercury Press, Rockville, Md.

More, Thomas A. 1973. Attitudes of Massachusetts hunters. p. 72-76. In Human dimensions of wildlife programs, John C. Hendee, and Clay Schoenfeld (eds.) Mercury Press, Rockville, Md.

Murie, Olaus J. 1954. Ethics in wildlife management. J. Wildl. Manage. 18(3):289-293.

Potter, Dale R., John C. Hendee, and Roger N. Clark. 1973. Hunter satisfaction: Game, guns, or nature? p. 62-71. In Human dimensions of wildlife programs, John C. Hendee and Clay Schoenfeld (eds.) Mercury Press, Rockville, Md.

Stankey, George H., Robert C. Lucas, and Robert R. Ream. 1973. Relationship between hunting success and satisfaction. p. 77-84. In Human dimensions of wildlife programs, John C. Hendee and Clay Schoenfeld (eds.) Mercury Press, Rockville, Md.

U.S. Department of Agriculture, Fish and Wildlife Service. 1977. 1975 National survey of hunting, fishing, and wildlife-associated recreation. U.S. Dep. Agric., Fish and Wildl. Serv., Washington, D.C.

Witter, Daniel T. 1977. Attitudes toward animals and their uses: Literature citations and animal welfare organization data. Natl. Tech. Info. Serv. AGERS-45, 79 p. Springville, Va., 79 p.

THE USE OF SURVEY INSTRUMENTS IN DETERMINING THE ECONOMIC VALUE OF ENVIRONMENTAL GOODS: AN ASSESSMENT[1]

David S. Brookshire

Thomas D. Crocker[2]

INTRODUCTION

Historically, the esthetic effects of pollution and landscape alteration have been given little attention in economists' efforts in quantitative policy analysis because they have been treated as intangibles. That is, by definition, esthetic attributes are incorporeal and awkward to define and formulate. Strictly interpreted, an intangible thing cannot be measured because no objective unit of measurement is known to exist or no acceptable method of measurement is available.

The application of economic analysis to esthetic phenomena offends many people. Even some economists are willing to argue that some kinds of pleasure and pain are perhaps best kept separate from the mean-minded activities of the marketplace (Bensusan-Butt 1974). Nevertheless, it is important to recognize that while the integrated body of analysis which constitutes economics should not be the only means for evaluating institutional or technological adaptations, or developing assessment methods for the social aspirations that cause esthetic and environmental insults, it does have its place. The economic treatment of environmental and esthetic issues as mere choices among human expedients views man as the "measure of all things." Thus, pollution damage to human health and happiness are really more "economic" than is damage to property. The latter is simply an intermediate means to health and happiness.

There exist philosophical views of the esthetic consistent with the application of economic analysis to esthetic phenomena. Consider the following statements of Berndtson (1969):

> ". . .beauty is an object of value, a process of evaluation, and a seizing in immediate enjoyment of what is valued in that process." (p. 185)
>
> Beauty thus illustrates an ideal of human experience: the act of valuation is competent to its task; the object valued is apprehended immediately rather than through surrogates; and the object valued is owned and enjoyed in the act of valuing it." (p. 185-186)

Esthetic experiences, then, involve a decision process differing from other decision processes only in that the valuation act and the enjoyment of the object are coincidental and immediate. If the form of the valuation procedure is independent of the enjoyment of the object, there is no reason in principle why standard economic-analytic techniques of valuation cannot be applied to esthetic phenomena. Economic analysis presumes, as does the above philosophical perspective, that beauty and its value lie in the eye of the beholder. Beauty, or esthetic phenomena, given some physical measure in accord with human senses, should in principle be no more unmeasurable in economic terms than the price of cabbage in a supermarket. No laws whatsoever governing economic activity are innate in the material objects of ordinary cognition. Economic laws relate to the subjective desires that motivate individuals to alter the facts of their environment. Thus no object becomes relevant in economic analysis until humans perceive it can be used for some subjective purpose.

Many material objects and services that provide esthetic experiences have public good attributes. There are no observable market prices for these goods and services from which to infer individual behavior and valuations. Survey instruments obtaining information about the manner in which individuals behave when confronted with these experiences as well as the values they attach to them must therefore usually be adopted as the means of acquiring the necessary data.

Recently a host of efforts in the valuation of environmental goods have been attempted. These efforts are termed contingent claims

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[2/] The authors are Assistant Director and Director, Resource and Environmental Economics Laboratory, and Assistant Professor and Professor of Economics, University of Wyoming, Laramie.

mechanisms. Within the overall approach, there are direct and indirect techniques. The first is termed the bidding game approach and the second the substitution game approach. A bidding game elicits information necessary for the estimation of a Bradford bid curve (Bradford 1970). The survey instrument is a structured device that draws upon routinized and institutionalized settings to elicit bids. A substitution game elicits information necessary for the estimation of a household production function. The survey instrument elicits activity time, expenditure, and location information. The output of the estimation process is a compensated demand curve for the good being valued. See Blank et al. (1977) for a discussion of the model and estimation process. A wide variety of environmental goods has had these techniques applied in a valuation procedure. Randall et al. (1974) and Blank et al. (1977) attempted to value visibility changes in the Four Corners Region of the Southwest. Brookshire et al. (1976) addressed the problem of potential visibility reduction in the Glen Canyon National Recreation Area resulting from the proposed Kaiparowits coal-fired power plant. Thayer and Schulze (1977) attempted to value the lost esthetic value in the Jemez Mountains, New Mexico, resulting from geothermal development. The problem of esthetic effects of strip mining in Appalachia was addressed by Randall et al. (1977). Brookshire and Randall et al. (1977) applied the bidding and substitution game techniques to valuing wildlife resources in the Rocky Mountain Region.

The magnitude of the valuation results obtained from studies employing contingent claims mechanisms has been surprisingly large. For the Brookshire et al. (1976) study the average bid per family or recreator group was $2.77 in additional entrance fees per day in 1974 dollars. The total annual bid, which can be interpreted as an aggregate marginal willingness to pay to prevent one additional power plant near Lake Powell, was over $700,000. If one were to extrapolate to the 15 national parks and recreation areas within a 100-mile radius of the proposed Kaiparowitz site, the aggregate bid would approach $20 million per year.

The Blank et al. (1977) experiment resulted in an extrapolated annual estimate for visibility reduction in the Farmington, N. Mex. area of $916,000 for the Navajo Reservoir. This is roughly consistent with the Glen Canyon National Recreation Area results.

Finally, the Brookshire et al. (1977) wildlife valuation experiment produced an estimated valuation of $72 per year to increase expected elk encounters from 0 to 5 per day of hunting. This is consistent with fees charged by private clubs ranging from $85 to $150 per year.

The value estimates in the above results are quite large, but economists thoroughly distrust the results because of the methodologies used.

All of these studies have required application of survey instruments. While contingent valuation approaches are soundly grounded in economic theory, a major point of contention among economists has been the use of survey instruments for gathering data. The following statement by Fromm (1968) exemplifies the attitude: "Furthermore, it is well known that surveys that ask hypothetical questions rarely enjoy accurate responses." (p. 174) A lengthy discussion of the use of questionnaires in the paper on which the Fromm (1968) effort is a commentary is summarily dismissed with this single unsupported statement. See Blank et al. (1977), Brookshire et al. (1977) for the development of the theoretical underpinnings of the contingent claims mechanism. An additional area of concern has been whether individuals exhibit strategic behavior when responding to survey instruments. Strategic behavior by individuals is exhibited when the respondent is presented with an incentive structure in a survey instrument and then attempts to influence the outcome. Subsumed in this is the notion of the free-rider problem on which economists have produced volumes of literature. The problem of strategic behavior has been viewed as one of the major impediments to the valuation of environmental goods. See Brookshire et al. (1976), Blank et al. (1977), Brookshire et al. (1977) and Thayer and Schulze (1977) for the lack of empirical evidence for strategic behavior. In spite of practically no empirical evidence to support the existence of strategic behavior by individuals when responding to a questionnaire about environmental and esthetic phenomena, economists have expended enormous intellectual energies in devising ways to cause individuals to reveal their behavior and their preferences truthfully when responding to questions about these and other nonmarketed goods. Originally set forth in "A New Principle of Just Taxation" by K. Wicksell (Musgrave and Peacock 1967) in 1869, the public goods preference revelation problem was rediscovered by Samuelson (1955). The first reasonably complete preference revelation device is in Clarke (1971). Smith (1977) provides an up-to-date review of the problem and its suggested solutions. Perhaps because they are complex, few, if any, of these devices have found their way into actual survey instrument construction. Nevertheless, the volume of papers devoted to the issue of obtaining accurate revelations of preferences for nonmarketed goods gives weight to any assertion that economists distrust empirical results based on data generated by questionnaires.

The purpose of this paper is not to debate the reality of strategic behavior. Instead, the intent is to raise the possibility economists, by their near-exclusive devotion to the strategic behavior problem, have neglected many of the analytical and empirical advantages gained through the use of survey instruments.

NEED SURVEY INSTRUMENTS BE HYPOTHETICAL

Fromm (1968) and many other economists believe hypothetical questions generate inaccurate

answers. These inaccuracies, if one judges by the relative emphasis in the literature, are caused by an incentive to give untruthful answers. The incentive stems from the advantages the individual perceives would accrue to him if he behaves strategically. Presumably one knows the answers are untruthful because the individual's observed behavior and the preferences this behavior reveals are often not consistent with the individual's statements about his preferences. If one believes hypothetical statements are imaginary (fictional), then he would hardly be surprised by these discrepancies. Another interpretation is possible, however.

The dictionary defines a hypothetical proposition as a conditional proposition (i.e., an "if x, then y" statement). A hypothetical question would then be a conditional statement in the subjunctive mood, an "if x were. . ., then. . .?" statement. In a survey setting, the hypothetical question is posed by the interviewer to the respondent; the respondent then states how he intends to behave in the posited situation. Thus, the respondent might be shown a number of pictures of different landscapes and be asked his expectations about his budget and/or time allocations for each of the depicted landscapes.

Formally, the problem set before the respondent seems no different than the problem faced when planning on the basis of a weather forecast to spend an afternoon at a picnic. The respondent's realized activities and planned activities are neither instantaneous nor coincidental. An updated forecast altering the type of weather expected, may change the respondents' plans to spend only enough time at the picnic to eat lunch. Realizing that meteorology is an inexact and conditional science, the respondent will, if it is not too comsumptive of energy, be prepared to change plans again on receipt of new information.

It would be surprising if frequent discrepancies did not occur between responses to hypothetical questions and subsequently observed behavior. A contingent answer is acceptable given the well defined circumstances presented to the respondent. The question of inaccuracy is not whether given a change in circumstances the observable behavior pattern changes but whether the contingent answer can be observed when the defined circumstances have not changed. Only if the answers relate to past rather than intended behavior will a simple comparison of answers with actual behavior suffice to ascertain the accuracy of the answers. Otherwise, one must explain how the individual responds to new information and circumstances in order to perform the comparison.

Even if the previous argument is accepted, the question remains as to how contingency answers fit into the consumer's surplus framework. This framework provides the analytical engine by which economists attach values to nonmarketed goods.

Assuming for simplicity that the questionnaire respondents' demand for an activity is weakly complementary in the nonmarketed good of interest, it is easy to illustrate the relation between hypothetical environmental or esthetic states and consumer's surplus. According to Maler (1974, pp. 183-189), weak complementarity exists if the quantity demanded of a private good or activity is zero when the marginal utility of the public good is zero. The condition permits one to avoid having to solve for utility and expenditure functions when trying to establish the demand for a public good by exploiting its connections with private, marketed goods. In figure 1, participation in the activity with which the nonmarketed good is associated is assumed to have an invariant opportunity cost of p. This opportunity cost is independent of the level of availability of the nonmarketed good. The $\bar{D}$ curve in figure 1 gives the individual's income-compensated demand function for an activity, A, averaged over all possible levels of the nonmarketed good. For example, A might be a fishing activity and the nonmarketed good might be atmospheric visibility.

The ability to see distant mountains from the fishing location is assumed to enhance the utility of the fishing activity. As shown in the figure, the efficient plan for the individual with no forecast of the availability of the nonmarketed good is to look forward to undertaking the activity at level a_0. Activity level a_0 is assumed to represent a day with average visibility versus clear or murky. At this level, the marginal value attached to an additional planned unit of the activity just equals his opportunity cost. The consumer surplus expected from the activity once actually participated in is the area above the opportunity cost line and beneath the demand function. In short, the area under the "average demand" function, $\bar{D}$, is the individual's mathematical expectation of the valuation attached to the planned activity levels, once realized.

Now suppose the individual receives additional information about the availability of the nonmarketed good. Again for simplicity, assume that the additional information will indicate whether the atmosphere will be clear, C, or murky, M, on the day planned for undertaking the fishing activity. The manner in which the angler will revise the estimates about the probability of clear or murky conditions can be described by Bayes' (1764) rule. A good elementary presentation of Bayes' (1764) rule is available in Raiffa (1970, pp. 17-21). For instance, if the improved information predicts clear atmospheric conditions, the angler's subjective evaluation of the average compensated demand function will be $\bar{D}/C$. The level of the activity then planned to be undertaken will increase to a_0^C. Moreover, the area, b-d-e-f, gives the increase in expected utility if "clear" is the forecast of atmospheric visibility. Similarly, if the forecast states "murky," the angler's expected utility level will be reduced to a_0^M, and the area, b-d-h-g, gives the loss in expected utility due to the forecast.

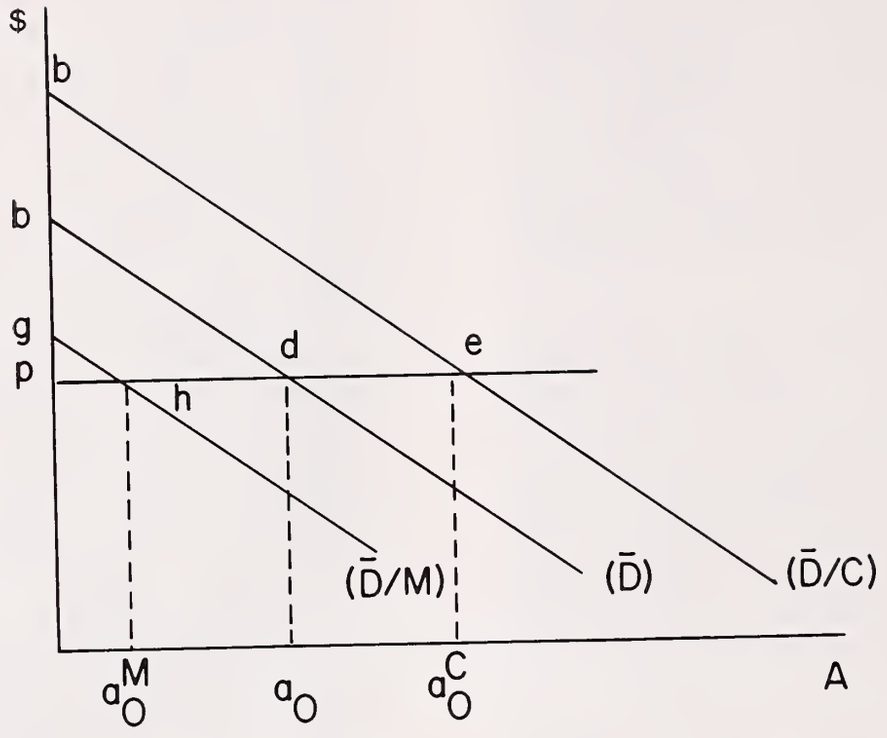

Figure 1.--Effect of an improvement in information on Consumer's Surplus.

In essence the consumer surplus an individual expects to obtain from the availability of a nonmarketed good can be extremely sensitive to the state of information about this availability. This expectation determines the commitment of resources and time--behavior. Adaptive behavior, once having committed one's self and experiencing unanticipated regret or satisfaction thereby, can be treated as the acquisition of further information. Customary treatments of consumer surplus refer to the surplus an individual obtained from participating in an activity, given (implicitly) the state of information at the instant of the actual participation decision. The information at this instant need not be complete. When dealing with a hypothetical situation, the consumer surplus measure refers to the value the individual expects to obtain. This decision is dependent on the state of information about the availability of the public good at the time the hypothetical decision is made. Obtained surplus refers to the surplus associated with $\bar{D}$; the anticipated surplus refers to surpluses associated with demand functions similar to $\bar{D}/C$ and $\bar{D}/M$. Expectations can, in principle, be equally disappointed or fulfilled with $\bar{D}$ as with $\bar{D}/C$ or $\bar{D}/M$. The substance of consumer surplus is not at all altered by increasing the possibility of information acquisition. The dismissal of the use of questionnaires because of their hypothetical nature seems little more than insisting reality conform to analytical habit and convenience.

SURVEY INSTRUMENTS AND BENEFIT-COST ANALYSIS

By attributing discrepancies between stated and realized choices solely to strategic behavior, economists, as the preceding section argues, may have often misconstrued the meaning of data acquired by survey techniques. In addition to strategic behavior and acquisition of information, there is another and potentially more important reason for these discrepancies. For nonmarketed goods, the hypothetical world circumstances posited in instruments differ from the circumstances in the world of observable behavior. This is the essence of the difference between questionnaires and instruments. The mechanisms currently employed for valuing nonmarket goods must, by definition, posit a contingent world representing a different level of the environmental good. In this section, we will argue that the circumstances in the world of instruments correspond closely to the analytical foundations of benefit-cost analysis. That is, data gathered by survey instruments may often, for nonmarketed goods, be more consistent with economic theory than is data generated by observable, realized behavior.

The employment of benefit-cost analysis is an attempt to ascertain the quantity of some numeraire (e.g., current dollars) the gainers and losers from some proposed public investment will

consider equivalent in value to their respective gains and losses. The price structure, where price is a sufficient measure of social as well as private value, represents the terms in which the world is evaluated. Prices, as generated by market exchange and adjusted in proportion to excess demand, embody all relevant information about relative economic scarcities and are a sufficient means of allocating resources to their socially most highly valued uses. Benefit-cost analysis is an attempt to ascertain what individuals are willing to pay and/or would have to be paid for the public investment in a world where markets are pervasive.

If realized market behavior is used as the data base for establishing these valuations, the analyst uses propositions from economic theory for two purposes: (1) to infer what the price structure would be in a world of pervasive markets; and (2) to reason from the pervasive market price structure to the implied consumer valuations. When survey instrument responses are employed for the data base, the first step can be avoided, provided the conditions posited in the instrument correspond to a world of pervasive markets. One might reasonably question whether the conditions corresponding to a world of pervasive markets are sufficiently close to a respondent's experiences to be meaningful. This justifiable doubt must be weighed, however, against the difficulties of carrying through the analytical exercises necessary to construct a pervasive market price structure from initial knowledge of the price structures of a world where markets for many goods are not pervasive. The way in which this difficulty is customarily avoided when using observable, realized prices is to assume that the observed prices correspond to those in a world of pervasive markets.

It is relatively easy to construct examples to make apparent the difficulties of reasoning to pervasive markets from observations on non-pervasive markets. Consider costs of exchange, a phenomenon present whenever valuable resources (e.g., time, information, legal and police services, etc.) must be expended to perform the exchange process.

In figure 2 the individual's initial endowment of Y_1. and Y_2 is at Q. When exchange processes become costly, the individual's budget constraint will vary according to initial endowment. This is because the costs of the act of exchanging Y_1 for Y_2 differ from the costs of exchanging Y_2 for Y_1. Thus, from the perspective of a single individual, the cost of engaging in a transaction in which an automobile owner by the individual is to be exchanged for clean air may differ from these same costs in a transaction where clean air is exchanged for automobiles. Thus, if the exchange act is costly, an initial endowment of Q implies a budget constraint of VQV, whereas if the exchange act is costless, the budget constraint is MM, the customary form which is an integral part of derivations of demand functions and their associated consumer surpluses. When the individual completes the exchanges during the period, Y_1^0 and Y_2^0 will be selected as an optimum if MM is operative. If VQV is the operative budget constraint, Y_1' and Y_2' will be selected. If some point on MM other than Q constitutes the initial endowment, costly

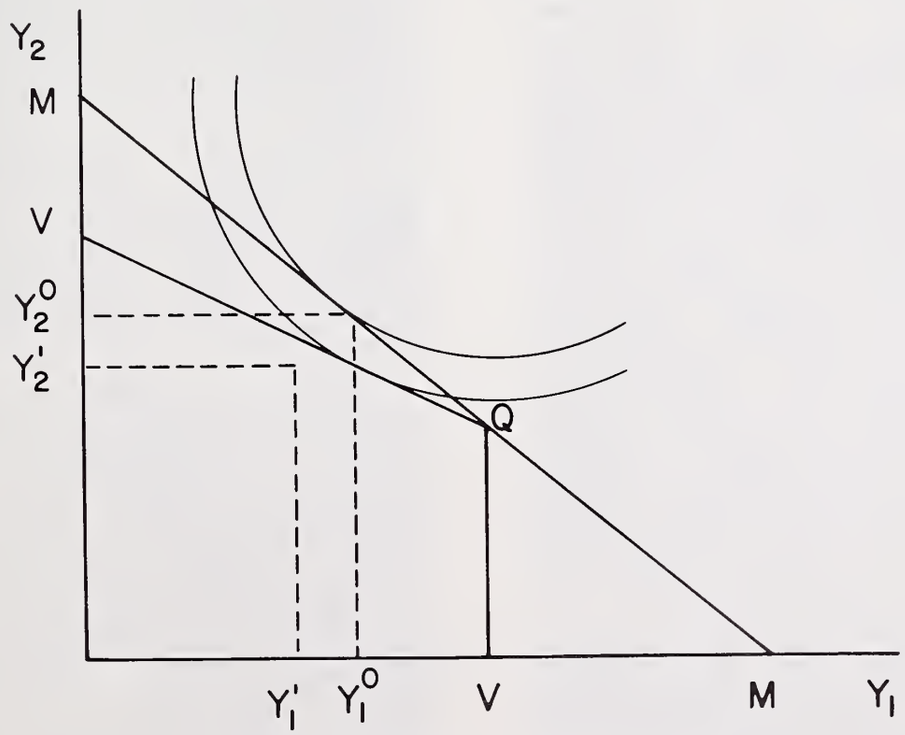

Figure 2.--Effect of Costly Exchange.

acts of exchange will mean a budget constraint different from either VQV or MM may be operative because the costs of exchange acts may differ by the relative quantities of the goods in the initial endowment as well as by types of goods. Thus, the individual budget constraint may vary according to the form in which the initial endowment was accumulated, although the market value of this endowment may be identical for many combinations of Y_1 and Y_2. Since costs of the exchange act differ according to the original Y_1, Y_2 combination, each combination will result in a different and generally nonlinear budget constraint. From this it follows from the individual's perspective, a dollar is not an explicit, invariant pecuniary measure. Instead, the subjective value of an additional dollar depends on the form of the income change (i.e., on the good in which the increment is embodied). Moreover, it appears realized market behavior is dependent not only on money incomes and relative market prices of goods, but also upon the combination of goods the individual starts with and the relative and absolute costs of exchange associated with those goods. These costs of exchange acts are probably neither trivial nor similar across individuals.

The huge sums spent on industries (law, middlemen, etc.) whose major or sole purpose is to facilitate exchanges attests to their importance. In addition, if exchange act inputs, including native intelligence and training, are not distributed equally across the population, and if these inputs contribute positively to the effectiveness of an individual in producing exchanges, then costs of exchange acts will not be similar across individuals.

If realized market behavior depends on the costs of the exchange act for the bundle of goods an individual holds, if for the same bundle of goods these costs differ across individuals, and if individuals do not hold similar goods bundles, then the analytical effort required to infer what the price structure would be in a world of pervasive markets must clearly be greater (probably much greater) than when all individuals have no exchange act costs. Therefore, budget constraints are invariant with respect to the bundle of goods held. Rather than facing these and similar analytical complexities directly in order to construct the price structure of a world of pervasive markets, it may often be more effective to question the individual about his responses where he is to assume that markets are pervasive. That is, the individual is allowed to respond directly to a perturbation in a world of pervasive markets rather than having the investigator try to infer what the individual would do in a world of this sort from information about a world where markets are not pervasive.

An individual may be able to state preferences for a particular state of the world quite clearly. However, if markets are nonexistent or incomplete (as they in fact are for a great many esthetic and environmental goods), there may be no means to communicate these preferences. The very lack of markets is due to the costs of forming and maintaining them and the costs of the act of exchange. In a survey instrument a hypothetical (contingent) world can be constructed in which costless means of communication are available. On occasion, therefore, the individual's preferences are perhaps more readily inferred from statements rather than from behavior. The individual who drives a 1965 Plymouth Valiant and states a preference "for" clean air has no market in which to directly exchange the old heap for some clean air.

CAN SURVEY INSTRUMENTS REDUCE A PRIORI ASSUMPTIONS?

The ability of the human mind to cope with complex reality is limited. Successful grappling requires that the dimensionality of reality be reduced. When trying to establish the collection of values individuals place upon nonmarketed goods, there are at least two general ways to drastically reduce the number of parameters that must be estimated. First, one can draw upon a priori restrictions from the economic theory of the consumer. Second, one can adopt an experimental approach to the question of data.

Economists who have ever seriously worked with problems of consumer analysis are thoroughly familiar with three fruitful a priori restrictions (additivity, homogeneity, and symmetry) that come from the neoclassical demand theory of Shutsky (1915) and Hicks (1934). Further reductions in dimensionality of the parameter space in which estimation is to be carried out can be achieved by judicious invocation of various separability conditions. Perhaps the best overall review of the state of demand theory from the perspective of the development of a priori restrictions to assist in estimation problems is Goldberger (1967). Finally, recent developments in the application of mathematical duality principles to consumer theory allow one to reduce the number of parameters to be estimated without imposing particular monotonicity and curvature properties upon the consumer's maximization problem. Diewert (1974) reviews the applications of duality theory to economic problems.

The second general class of means of reducing the parameter space includes experimental as well as questionnaire techniques. These techniques are advantageous, even though widely neglected in economics, because they permit the investigator to control the number and levels of different physical contexts and adaptation opportunities to which the individual must respond. The setting is one in which disturbances imposed by confounding variables upon the responses of interest are partially controlled for in the data generating exercise. This contrasts with the standard practice of placing sole reliance in an ex post fashion upon the application of multivariate parametric estimation techniques. For

a given number of observations, questionnaires increase degrees of freedom and the efficiency of estimators.

The use of experimental and survey techniques to reduce the parameter space may not be advantageous only on statistical grounds. Often, as noted earlier, the investigator imposes ex post various separability conditions upon market-generated data in order to make it more tractable. These separability conditions may imply, for example, that beer drinking at the local tavern is not a substitute for cross-country skiing. The conditions are imposed without consulting the individuals whose responses are registered in the market data. They are instead generated by what the investigator intuitively feels to be "reasonable," and what is required for analytical convenience. It is by no means clear that the investigator's "feelings" and the framework used in accounting for what is and what is not important is to be preferred to actually providing the respondent with the opportunity to give a response to contingencies. The details to be abstracted from are presented to the respondent rather than being left to the mind of the investigator. In both situations, simplifications are made to permit the investigator to work with the data. In the survey instrument case, however, the respondent gets the opportunity to weigh the importance of these confounding variables to the choices. In the observed behavior case, the investigator is presuming to know as well as the respondent what, from the respondent's perspective, is and is not an irrelevant alternative. Survey instruments allow the domain in which the response data is generated to conform to the structures of the underlying analytical model rather than forcing, via a set of possibly tenuous assumptions (e.g., the absence of jointness, the presence of perfect competition, etc.), the real-world-generated data to conform to the preconceptions of the model.

A slightly different facet of the above point arises with the recognition that much market data used by economists for empirical analysis is collected by agents who are often untrained and usually many times removed from the economist-user. Often, this data is collected as by-products of the activities of organizations whose interests are far removed from and possibly much less disinterested than the research economist. The old saw about lying with statistics can just as readily refer to the manner in which data are organized for presentation as to the manner in which already organized data are employed for estimation purposes. Except possibly in the case of direct investigator observation of market responses, the generation of response data via survey instruments or experimental means can make the specific connection between the reporting of data and its uses for testing hypotheses strong and certain. The investigator then has no choice but to accept the responsibility for the questionnaire data generated. He must accept ultimate responsibility for the origin of the data, as well as the analytical model and the estimation procedures used to test hypotheses.

SURVEY INSTRUMENTS AND PROPERTY RIGHT STRUCTURES

Market prices act as devices to signal and coordinate the purchases and activities of disparate individuals. For example, the spot exchange of two currencies requires no statement of the terms other than the exchange ratio. When cardinally measurable and homogeneous commodities such as currencies are exchanged, the parties to the enterprise need only count the quantities exchanged to establish what they have obtained.

In valuing environmental goods, there are two issues at hand. First, given an existing property right structure, what is the value? Second, what would be the value of the environmental good if the property right assignments underwent a reassignment? The first issue, while important, can be assumed accomplished if the second issue can be answered.

The problem in answering the second issue is that the costs of exchange cannot be assumed to be as trivial as in the exchange ratio example. If one adopts an economic efficiency perspective, then trivial exchanges are not forthcoming due to tracing the parties initially responsible for the environmental or esthetic effect, detailing the actual levels of the effect, and finally ascertaining the contributions of each perpetration of the effect.

When these costs of the act of exchange exist, the economic structure itself becomes a variable of the decision problem. The problem can be viewed as finding a set of obligations for each individual's behavior pattern to make costs and rewards less dependent on joint relations with other individuals using the same nonmarketed good. Rules of evidence and procedure are established for all users. Likely and important contingencies will be specified, and appropriate responses will be stipulated. Objective, easily measured performance standards will be formulated. In short, the assignment of property rights as well as the property rights structure itself is changed. These reassignments and restructurings of property rights have been a means by which environmental and esthetic insults have been controlled. It is likely they will continue to be a major means.

There exist analytical devices in economics that allow one to ascertain the effect of property rights reassignments of an environmental or esthetic good upon consumer valuations. If there is an increase in pollution, the amount the sufferer would have to be paid in order to be willing to accept the increase is consistent with the polluter being liable for the damages caused.

The amount the consumer would be willing to pay to prevent the increase implies that the polluter has zero liability for any harm imposed upon the sufferer. These valuations can be established with time and budget allocation data obtained through behavioral observations or by questionnaires. However, where the conditions of use, exclusion, or alienation are altered (i.e., property rights are restructured), there is no everyday behavior to observe, except insofar as one is willing to draw analogies from observed behavioral responses to changes in the property rights structures of other goods. If one knew what the availability of the environmental good would be under the property rights restructuring, it might seem one could, if one had everyday behavioral observations on consumer time and budget allocations at the same level of availability, determine the change in consumer valuation due to the property right restructuring. Furthermore, since consumer valuations will, through either the market or the political process, influence the level of availability, how is one going to reason from the level of availability to consumer valuations for the restructured property right? Thus the only sound way of obtaining an estimate of whether the net benefits of a particular property rights restructuring are positive, if one insists upon employing observed everyday behavior, would be to perform the restructuring and observe the results. To measure is not necessarily to understand. Trial and error can be an extremely costly way to perform research because the errors are real rather than hypothetical. In contrast, survey instruments allow one to investigate the behavioral responses to a wide variety of property rights structures without involving the citizenry in the traumas of social experimentation.

One cannot observe directly everyday behavioral responses to property rights structures that have never existed. Similarly, one cannot observe directly the everyday behavioral responses of individuals who have never participated in activities with which the environmental or esthetic good is associated at the levels at which the good has been historically available. If some of the proposed levels of availability have not been historically available, and if some former nonparticipants would become participants at these new levels, the use of data on observed behavior to ascertain valuations would mean the valuations of the would-be participants play no part in determining the valuation. For each proposed level of availability, the use of observed, realized behavior to establish valuations will mean only historical participants may be counted. Those who have not participated historically have no opportunity to communicate their preferences. Survey instruments, because they allow the researcher to introduce broader than historic ranges of available environmental or esthetic good can allow the values of historical nonparticipants to become relevant. Experience has shown unless this process begins with the current property rights structure, respondents have difficulty in answering. However, this does not prevent the eventual valuation under a new property right structure. See Blank et al. (1977), Brookshire et al. (1977) for these points.

CONCLUSIONS

The preceding is a taxonomic discussion of some reasons why survey instruments may be a superior means of generating data with which to value environmental and esthetic goods. It is argued that economists have erred in viewing the situations they point out as necessarily fictional; that the data generated by survey instruments may, for nonmarketed goods and the activities with which they are associated, accord more closely with the conditions of received economic theory; that survey instruments make it easier to remove the difficulties of estimation and interpretation introduced by confounding variables; and that survey instruments often permit one to more readily deal with phenomena that have not been in the range of historical experience. These are indeed substantial advantages that economists have not recognized or appreciated. However, recognition of the advantages does not cause the disadvantages to disappear.

LITERATURE CITED

Bayes, T. 1764. An essay towards solving a problem in the doctrine of changes. In Philosophical transactions, giving some account of the present undertakings, studies, and labours of the ingenious in many considerable parts of the world for the year 1763. The Royal Society, London.

Bensusan-Butt, D. M. 1974. Political economy for esthetics. Aust. Econ. Pap 13:178-187.

Berndtson, A. 1969. Art, expression, and beauty. Holt, Rinehart, and Winston, Inc., New York.

Blank, F. et al. 1977. Valuation of esthetic preferences: A case study of the economic value of visibility. Res. Rep., Elec. Power Res. Inst., Resour. and Environ. Econ. Lab., Univ. Wyo., Laramie.

Bradford, D. F. 1970. Benefit-cost analysis and demand curves for public goods. Kyklos 23.

Brookshire, D. S. et al. 1976. The valuation of esthetic preferences. J. Environ. Econ. and Manage. 3:325-346.

Brookshire, D. et al. 1977. Economic valuation of wildlife. Final Rep., Phase I., U.S. Dep. Agric., Fish. and Wildl. Serv., Resour. and Environ. Econ. Lab., Univ. Wyo., Laramie.

Clarke, E. 1971. Multipart pricing of public goods. Pub. Choice 11:17-33.

Diewert, W. E. 1974. Applications of duality theory. p. 106-160. In Frontiers of quantitative economics, Vol. II, D. A. Kendrick (ed.) North Holland Publ. Co., Amsterdam.

Goldberger, A. S. 1967. A review of consumer demand theory. Syst. Formulation, Methodol., and Policy Workshop Pap. 6703, Soc. Syst. Res. Inst., Univ. Wisc., Madison.
Hicks, J. R. 1934. A reconsideration of the theory of value, Part I. Economics 1:52-76.
Maler, K-G. 1974. Environmental economics. Johns Hopkins Press, Baltimore.
Musgrove, R., and A. Peacock (eds.). 1967. Classics in the history of public finance. St. Martins Press, New York.
Raiffa, H. 1970. Decision analysis. Addison-Wesley, Reading, Mass.
Randall, A. et al. 1974. Bidding games for valuation of esthetic environmental improvements. J. Environ. Econ. and Manage. 1:132-149.
Samuelson, P. 1955. Diagrammatic exposition of a theory of public expenditure. Rev. Econ. and Stat. 37:350-356.
Scitovsky, T. 1976. The joyless economy. Oxford Univ. Press, New York.
Shutsky, E. 1915. Sulla teoria del bilancio del consumatore. Giormale Degli Econ. 51:1-26.
Smith, V. L. 1977. The principle of unanimity and voluntary consent in social choice. J. Polit. Econ. 85:1125-1140.
Thayer, M., and W. Schulze. Valuing environmental quality: A contingent substitution and expenditure approach. Res. Pap. Univ. South. Calif., Los Angeles.
Weisbrod, B. A. 1968. Concepts of benefits and costs. p. 257-262. In Problems in public expenditure analysis, S. B. Chase (ed.) Brookings Inst., Washington, D.C.
Wicksell, K. 1967. A new principle of just taxation. In Classics in the theory of public finance, R. Musgrove and A. Peacock (eds.). St. Martins Press, New York.

USER-BASED ASSESSMENTS OF THE VALUE OF FISH AND WILDLIFE RESOURCES

David A. King[1]

INTRODUCTION

The purpose of this paper is to discuss methods being used in two studies now underway to estimate the demand for and the economic value of a wildlife resource and a trout fishery. The general approach being taken is the application of a modified form of the Hotelling-Clawson model (Clawson and Knetsch 1966; Brown and Nawas 1973; Gum and Martin 1975). The distinguishing methods being used in these studies relate to achieving better measurement of "tastes and preferences" and improved specification of their influence on demand. To noneconomists, the emphasis of this paper may appear to be demand rather than value. However, estimates of value are calculated from estimated demand functions for the environment or resource.

STUDY SITUATIONS

The wildlife appreciation study[2] is being carried out in Cave Creek Canyon of the Chiricahua Mountains[3] of southeastern Arizona. The Canyon is in the Coronado National Forest. Portions of the study area are privately owned, but the major share of the wildlife appreciation activities of visitors occurs on national forest lands.

The major wildlife attraction in the area is the coppery tailed trogon. Bird watching activity in the trogon nesting area is increasing rapidly, causing the USDA Forest Service to institute regulation of the activity.

Because of the private residences and public visitor facilities, hunting is not a major activity in the Canyon proper. The facilities, however, do provide bases from which hunters may carry on their activity.

Visitors to the area are being sampled as they leave it. Wildlife appreciators are identified and a sample of them will be surveyed by mail to gather the data for the study. Wildlife appreciators are identified as those respondents who mention wildlife-related elements in response to an open-end question regarding the attractions of the Canyon and/or mention participation in a wildlife-related activity during their visit.

The trout fishing study is being carried out on the Fort Apache Indian Reservation (also known as the White Mountain Apache Reservation).[4] The tribe sells fishing permits on a daily or annual basis. Their objective is maximization of net revenue. To aid the tribe in developing fee and management strategies, we are studying the structure of demand for trout fishing in the major use area of the Reservation.

Personal interviews of an on-site sample of fishermen are being conducted at 21 fishing sites. A mail survey is also being conducted with a sample of purchasers of fishing permits.

ECONOMIC MODEL

As stated above, the economic model being used is that developed by Clawson (1959) based on a suggestion by Hotelling (1947). Since first applied by Clawson, the approach has been greatly modified, primarily in response to Clawson's own discussions of its shortcomings.

The demand for a good or service is a function of the price of the good or service, prices of substitutes, income, tastes, and preferences. Ignoring, for the moment, tastes and preferences, the specific method being used is that of Sublette and Martin (1975) and also reported by Gum and Martin (1975). In general, it is an individual approach to demand estimation as opposed to the aggregate approach used in most studies employing the Hotelling-Clawson model.

1/ The author is Professor, School of Renewable Natural Resources, University of Arizona, Tucson.

2/ This study is supported by the McIntire-Stennis Forestry Research program at the University of Arizona, project 2016-4168-03 and Wildlife Management Institute, the American Petroleum Institute, and the National Wildlife Federation.

3/ Shaw, William W., and David A. King. 1977. Nonconsumptive uses and values of wildlife at selected locations in southern Arizona. Unpublished research proposal. University of Arizona, School of Renewable Natural Resources.

4/ This research is supported by the Regional Research program of the University of Arizona, project W-133, and the Rocky Mountain Forest and Range Experiment Station, grant agreement 16-736-GR.

In the two studies, trips per individual will be the quantity variable. Price will be represented by the variable costs of participation. Substitution possibilities will be taken into account by measuring the total trips taken for wildlife appreciation to places not in Cave Creek Canyon and total annual expenditures for wildlife appreciation trips, and total fishing trips per year taken to places not on the Reservation. Demand functions within income classes will be estimated as suggested by McConnell (1975).

TASTES AND PREFERENCES

Cross-section analyses are typically used in outdoor recreation demand studies because reliable data time series are not available. In these studies, the potential for variations in preferences among individuals has been recognized as important for some time (King 1968). The typical approach to this problem has been to include socio-economic variables in the demand specifications tested. It was hypothesized these variables could stand as proxies for preferences. In terms of explaining variation in recreational activity, the results have been equivocal or negative (King 1968, Gum and Martin 1977).

Gum and Martin (1977) investigated the structure of demand for outdoor recreation in Arizona. Based on 49 variables, they derived 8 structural dimensions of demand. Using these dimensions, they identified eight types of recreationists and an unclassified group. They concluded for 70 percent of the households in Arizona tastes and preferences were the most important factors influencing outdoor recreation activity.

We have found preference variables derived from a factor analysis of respondent rankings of preference for activities (Richards and King 1977) are better predictors of whether or not a household engaged in an activity than are household characteristics.

In recognition of the importance of preferences, an expansion of the preference-forming process was included as an element in a heuristic model for recreation behavior developed by King and Richards (1977). The model provides the general conceptual underpinnings of the two studies described here.

Wildlife Appreciation Study

This project involves three major objectives: (1) estimation of the importance of wildlife using social-psychological measures; (2) estimation of the economic value of Cave Creek Canyon to the wildlife appreciators using it; and (3) determination of the existence of an association between the social-psychological measures of importance and the estimates of economic value. The social-psychological measures of the importance of wildlife can be considered as proxy measures of tastes and preferences.

The value of an object to an individual may arise from different sources or uses of the object. Hence, how wildlife appreciators rate various sources of wildlife values is being used as one of the measures of importance. In response to the question, "How valuable is it to you that wildlife are?", respondents are asked to rate various sources of value on a 0 to 10 scale. Two example of sources of value are "meat sources" and "subjects for nature study."

Presumably, wildlife appreciators with strong preferences for wildlife appreciation would rate the "nature study" source of value higher than the "meat source" of value.

Actions respondents have taken in support of wildlife conservation are another measure of importance. Included are such actions as joining wildlife organizations, contributing money to support of game and nongame wildlife programs, and lobbying for wildlife conservation programs.

Initial analysis will involve cross-tabulations of responses to identify potential patterns and groupings of responses indicating homogenous sets of respondents with regard to their feelings about the importance of wildlife. Beyond cross-tabulation, V-type cluster analysis will be used to identify one or more dimensions of the general domain of sources of value. V-type cluster analysis identifies items (variables) that scale the same dimension of a domain of interest. It is similar to factor analysis in that it groups variables representing similar structural information. Respondent scores on the scales identified will then be used in O-type cluster analysis to identify homogeneous clusters of respondents. O-type cluster analysis uses the dimensions identified by the V-type cluster analysis. Respondents are scored on the dimensions or scales identified by the V-type analysis and are then clustered based on similar scores on the various dimensions. For a complete presentation of the methods see Tryon and Bailey (1970). Estimates of the recreational experience demand function for each of the clusters will then be made using the Hotelling-Clawson approach.

If statistically significant differences in demand functions are found to exist between clusters of respondents, then this approach to incorporating tastes and preferences can be said to have been empirically successful. And, since the estimates of value will be derived from the demand functions, "better" estimates of value will result from the approach because of the improved specification of the demand functions.

It is important to note this approach is primarily empirical. The conceptual basis is not specifically defined, consisting only of the logic that ratings of sources of value and actions taken in support of wildlife should be associated with the economic values placed on wildlife as evidenced by the economic sacrifices made to engage in wildlife appreciation in the Canyon.

Trout Fishing Study

In this study the preferences are being measured in a more specific way than in the wildlife appreciation study. One instrument being used was developed by Driver.[5] Over a period of several years, Driver has developed a set of scales which measure the preferred psychological outcomes of participation in recreational activities. The theory of expectancy value is the conceptual basis for the scales. The empirical basis is over 30,000 usable responses of recreators in various parts of the United States.

The domains (clusters of associated scales) being tapped for this study are the following: achievement, independence/autonomy, equipment, family togetherness, being with people, learning-discovery, relationships with nature, reflect on personal values, creativity, nostalgia, exercise-physical fitness, escape physical pressures, escaping family, and temperature. Because the conceptual and empirical bases of these scales are well developed, O-type cluster analysis will be used directly to type the fishermen.

Contributions of natural environmental attributes to the satisfaction of the fishermen is being measured with an instrument developed by Brown et al. (1978). The dimensions being tapped are meadow-forest, water-related, wildlife, vegetation, topography, fish-related, nuisances, and intrusions. Attributes regarding man-made recreational facilities have been added for this study.

Examples of the two instruments are shown in figure 1. Part A is from the Driver instrument and Part B from the Brown instrument.

Based on a study of the users of the Flat Tops Wilderness in Colorado (Brown et al. 1978), it appears specific sets of environmental attributes may be related to specific sets of preferred psychological outcomes. Such relationships will be investigated in this study.

If such relationships are found to exist generally, they may provide a means of quantifying the contributions of an environment's attributes to the total value of that environment for a given recreational use. It would then be possible to develop value estimates that can be more readily generalized from area to area than those made from current valuation models.

Provided that sufficient observations are obtained, recreation experience demand functions will be estimated within clusters of respondents defined on the basis of preferred psychological outcomes, environmental attributes, and income.

5/ Driver, B. L. 1977. Item pool for scales designed to quantify the psychological outcomes desired and expected from recreation. Rocky Mtn. For. and Range Exp. Stn., Fort Collins, Colo. (mimeo).

Fishermen vary in their preferences. Things that one fisherman likes are often disliked by another. The questions below give you a chance to let the managers of the White Mountain Recreation Enterprise know about your preferences.

A. Different types of fishing opportunities provide fishermen different types of experiences. This question attempts to identify the types of experiences you desire to realize when fishing on the Fort Apache Indian Reservation. Several types of experiences are listed below. Please do not be bothered by duplication or similarity of some of the experiences, as we need your responses to all of them for greater accuracy.

Rate how much each of them either added to (+) or detracted from (–) the level of satisfaction you received on your last fishing trip to the Reservation. If any of the experiences are not relevant to you, mark the "Not applicable" box. Mark one box for each experience.

Experiences	Effect on Your Satisfaction: Adds to (+) — Most strongly	Strongly	Moderately	Slightly	Neutral	Detracts from (–) — Slightly	Moderately	Strongly	Most strongly	Not applicable
1. Getting out of doors										
2. Getting away from civilization for awhile										
3. Gaining a sense of self-confidence										
4. Viewing the scenery										
5. Thinking about your personal values										

B. The items below deal with different natural and man-made environmental features which might affect the enjoyment you get from fishing on the Fort Apache Indian Reservation. Please rate each of the following features of fishing sites in terms of how much each of them added to (+) or detracted from (–) the level of satisfaction you received from your last trip to the Reservation. If any of the features are not relevant to you when fishing on the Reservation, mark the "Not applicable" box. Mark only one box for each item.

Natural Environmental Features	Effect on Your Satisfaction: Adds to (+) — Most strongly	Strongly	Moderately	Slightly	Neutral	Detracts from (–) — Slightly	Moderately	Strongly	Most strongly	Not applicable
1. Clean fresh air										
2. Rainy weather										
3. Wide views of terrain										
4. Presence of mule deer										
5. Large roaring streams										

Figure 1.--The two survey instruments: Driver (A) and Brown (B).

FUTURE WORK

The approaches being taken in these two studies are primarily empirical. Although the scales measuring the preferred psychological outcomes and the contributions to satisfaction of environmental attributes have good conceptual and empirical bases, a specific conceptual link between them and an economic model of consumer behavior has not been made.

New approaches to consumer behavior, referred to variously as household production theory (Becker 1965; Lancaster 1971), hedonic price index theory (Muelbauer 1974), or the new theory of consumer behavior, are being developed

and may provide a framework for linking the social-psychological approaches and the economic approaches to quantifying the demand for the value of outdoor recreation resources. Work will begin soon to try to establish the linkage (King 1977).

The process of preference formation should be addressed (King and Richards 1977). The scales developed by Driver (1977) and Brown et al. (1978) measure the current state of these preferences for an individual. How did the individual come to hold them? If the process of preference formation were understood, then perhaps we might be able to predict changes in preferences over time.

CONCLUSIONS

Economic methods for user-based assessments of the value of natural environments for recreational uses are available. Further research and development of these methods should proceed along two lines to gain understanding of the process of preference formation and to incorporate existing measures of preferences into an economic model of demand and value.

Continuing research from various disciplinary viewpoints is needed to attain an understanding of human perceptions and valuations of natural environments. This understanding is necessary to the achievement of the ultimate goal of developing commensurable measures of the values of natural environments. More cooperation across disciplinary boundaries is needed.

LITERATURE CITED

Becker, G. S. 1965. A theory of the allocation of time. Econ. J. 75(299):493-517.

Brown, P. J., B. L. Driver, and C. McConnell. 1978. The opportunity spectrum concept and behavioral information in outdoor recreation resource supply inventories: Background and application. p. 73-84. In Integrated inventories of renewable nat. resour: Proc. of workshop, Gyde H. Lund, et al. (tech. coord.) [Jan. 8-12, 1978, Tucson, Ariz.] USDA For. Serv. Gen Tech. Rep. RM-55, 482 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Brown, William G., and Farid W. Nawas. 1973. Impact of aggregation on the estimation of outdoor recreation demand functions. Am. J. Agric. Econ. 55(2):246-249.

Clawson, Marion. 1959. Methods of measuring the demand for and value of outdoor recreation. Repr. 10, Resour. Future, Washington, D.C.

Clawson, Marion, and Jack L. Knetsch. 1966. Economics of outdoor recreation. Johns Hopkins Univ. Press. Baltimore.

Gum, Russell L., and William E. Martin. 1975. Problems and solutions in estimating the demand for the value of rural outdoor recreation. Am. J. Agric. Econ. 57(4):558-566.

Gum, Russell L., and William E. Martin. 1977. Structure of demand for outdoor recreation. Land Econ. 53(1):43-55.

Hotelling, Harold. 1947. Letter cited in the economics of public recreation: An economic study of the monetary evaluation of recreation in the national parks. U.S. Dep. Inter., Natl. Park Serv., Washington, D.C.

King, David A. 1968. Socio-economic variables related to campsite use. For. Sci. 14(1): 45-54.

King, David A. 1977. Integrating economic and psychological approaches to determining wildland recreation values. Study plan prepared for Coop. Agree. 16-770-CA, Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

King, David A., and Merton T. Richards. 1977. Determinants of choice in outdoor recreation: Avenues in application of economics. USDA For. Serv. Gen. Tech. Rep. WO-2, U.S. Dep. Agric., For. Serv., Washington, D.C.

Lancaster, Kelvin. 1971. Consumer demand. Columbia University Press, New York.

McConnell, K. E. 1975. Some problems in estimating the demand for outdoor recreation. Am. J. Agric. Econ. 57(2): 330-334.

Muelbauer, J. 1974. Household production theory, quality, and the hedonic technique. Am. Econ. Rev. 64(6): 977-994.

Richards, Merton T., and David A. King. 1977. The use of factor analysis in the development of outdoor recreation typologies. Sch. Renewable Nat. Resour., Univ. Ariz., Tucson.

Sublette, Werner J., and William E. Martin. 1975. Outdoor recreation in the Salt-Verde Basin of central Arizona: Demand and value. Ariz. Agric. Exp. Stn. Tech. Bull. 218, Tucson.

Tryon, Robert L., and Daniel E. Bailey. 1970. Cluster analysis. McGraw Hill Book Co., New York.

WHAT BELONGS WHERE: RESEARCH ON FITTINGNESS OF MAN-MADE STRUCTURES IN NATURAL SETTINGS[1]

Joachim F. Wohlwill[2]

Among the concerns of landscape architects and others involved in siting and design of man-made structures in natural settings the achievement of a sense of congruity between such structures and their surroundings has traditionally occupied a primary place. Landscape architects such as Simonds (1961) have stressed the feeling of harmony among the elements of a landscape as a major source of the sense of esthetic pleasure afforded by it, while even earlier Hubbard and Kimball (1929) among others went into great detail on the ways in which the landscape architect might strive towards a sense of fittingness in relating the color, form, and texture of his materials to the natural setting.

The appropriateness and suitability of particular buildings and other works of man in natural settings have likewise been at issue in recent controversies pitting environmentalists and conservationists against developers and commercial and industrial concerns. Consider the frequent battles fought in legislatures, court rooms, and communities over such issues as siting power plants, burying high-voltage transmission lines, constructing highways through parks, establishing recreational complexes such as that at Mineral King in the Sierras, etc. While these controversies clearly revolved around issues of conservation and protection of environmental quality as much as around matters of esthetic appearance, the latter aspect has generally played a prominent part, both explicitly and implicitly in debates between the opposing interests.

In spite of the practical relevance of the problem, little actual research has been carried out on the individual's response to this aspect of congruity or fittingness between man-made and natural elements. There are scattered studies on the determinants of visual intrusiveness of buildings and highways in the landscape (e.g., Steinitz and Way 1969, Hopkinson 1971), along with work by Zube et al. (1974) on the role of visual contrast and land-use diversity and compatibility in judgments of scenic quality. Of particular interest in the work of Zube et al. is the fact that an index of compatibility between adjacent land-uses devised by Hendrix and Fabos (1975) which was utilized in their research was found to be the best predictor of evaluations of perceived landscape quality.

The present investigation extends the above research by following an experimental approach in which specific man-made elements (i.e., buildings) are constructed to represent increasing levels of visual contrast with and obtrusiveness in their natural landscape settings, and presented to subjects for different types of evaluative judgments. The chief response variable in this paper involves direct judgments of the appropriateness of a man-made feature in its natural setting. The expectation was that these judgments would vary inversely with the amount of contrast and obtrusiveness. Esthetic preference, or liking, on the other hand, may be expected to exhibit an inverted-U-shaped relationship to level of contrast, such that preference will be maximal at some intermediate level. This assumption is based on an extension of optimal levels of stimulation notions such as have been advanced by Fiske and Maddi (1961), and in the realm of environmental esthetics more particularly by Berlyne (1967). This optimization function, while repeatedly verified for the variable of complexity, has not been subjected to similar empirical investigation with respect to the dimension of congruity.

A further variable is the nature of the context in which the man-made elements are shown, and specifically the scenic appeal of the context, as well as the amount of man-made development contained in it. Thus, it would be expected the perceiver would make more stringent demands on fittingness or congruence between a man-made object and its natural surroundings in a highly scenic area than would be the case in an area with more ordinary scenery. Similarly, in undeveloped landscapes the function relating contrast to judged appropriateness should display a steeper negative slope than in developed landscapes.

A final variable to be considered is the character and meaning of the man-made objects. Clearly the function attributed to a building will

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[2] The author is Professor of Man Environment Relations, Pennsylvania State University, University Park.

be an important determiner of its judged appropriateness in a particular landscape, and this factor is apt to interact with, and possibly even to mask, the role of visual contrast. Accordingly it was hypothesized judgments of appropriateness would decline more sharply with increasing contrast with respect to buildings bearing no essential relation to their landscape than with respect to buildings considered functionally appropriate in their setting.

METHOD

The nature of the proposed research, which called for the presentation to subjects of views of buildings systematically varying in contrast and obtrusiveness in relation to a constant landscape setting, required a method of simulation permitting the construction of stimulus series varying along the dimension just cited, while retaining a maximum of realism and fidelity to some prototypic landscape. To this end, two models of coastal landscapes were devised, and two types of model buildings were constructed in different versions so as to create a five-point scale of varying contrast and obtrusiveness of the building to its setting. The two models, to be designated as "scenic" and "plain," were designed to replicate coastal scenes encountered along the California coast. The scenic model simulated the area around Big Sur, being wooded, hilly, and generally rugged. The plain model was representative of coastal scenes encountered near Santa Barbara and other portions of southern California, being relatively flat and devoid of vegetation except for isolated trees. The "plain" landscape was employed in two different versions, an undeveloped one, (i.e., lacking any man-made features except for the particular building serving as focal stimulus for judgment, which was also true of the "scenic" model), and in a developed version, where the focal building was shown in a context of a variety of other buildings near-by. Thus, the focal stimuli were presented in three different settings: "scenic," "plain-undeveloped," and "plain-developed."

The two types of buildings selected were a "factory," and a "lodge." The former was actually a lumber-mill, and its function was made explicit by a sign, "Pacific Lumber," which was plainly visible in the foreground in one of the three simultaneously exposed views from which the building was presented. The latter was similarly identified by means of a sign, "Ocean Inn." Both the factory and the lodge were presented so as to vary in terms of (a) color and (b) size. The three color schemes employed, from lowest to highest contrast, were brown with dark gray roof, light gray with reddish brown roof, and white with bright red roof. Size was represented in terms of overall size and, in the case of the factory, addition or deletion of appropriate auxiliary structures. The two dimensions were combined into a single five-point dimension of contrast-obtrusiveness. For each version of each building in each setting, three slides were taken from different directions, two facing towards the "sea" (visible in the background) from each side, and the third facing toward the "interior." Black-and-white reproductions of slide-triads illustrating the lodge in the "scenic" setting and the factory in the "plain" setting are shown in figures 1 and 2.

Figure 1.--Reproduction of slide-triad representing the "lodge" at the lowest level of contrast-obtrusiveness, in the "scenic" setting.

Figure 2.--Reproduction of slide-triad representing the "factory at the highest level of contrast-obtrusiveness, in the "plain" setting.

Color slides were taken of the buildings in their settings by means of a camera especially designed for use in conjunction with the Environmental Simulator in the College of Environmental Design at the University of California at Berkeley. In addition to the series of target stimuli already described, a set of "filler" slides was constructed, utilizing a variety of other buildings such as apartment buildings, office buildings, gas stations, etc. photographed in the same scenery models. These pictures were included to avoid the sense of monotony that would result from viewing a series of slides containing only variations on the factory and the lodge themes.

Stimulus series

Each subject viewed a series of 24 slide-triads. The first nine triads contained three stimuli varying only in size, and three varying only in color, along with three filler triads. The remaining 15 contained 5 further filler triads along with 5 triads representing the factory in 1 of the 3 landscape settings in its 5 levels of contrast-obtrusiveness, and the lodge in a different landscape setting, in its 5 levels. Thus, three subgroups of subjects were required: group A viewed the factory in the plain-undeveloped setting and the lodge in the scenic setting; group B viewed the factory in the scenic setting and the lodge in the plain-developed setting; and group C viewed the factory in the plain-developed setting and the lodge in the plain-undeveloped setting.

Subjects

There were two groups of subjects. One (N=42) was drawn from majors in the various departments of the College of Environmental Design at the University of California at Berkeley; their median age was 23.9 years. The other (N=36) was drawn from classes in introductory psychology in the summer school at the California State University at Hayward; their median age was 21.5 years.

Procedure

The experiment was carried out in a small classroom with six to eight students at a time. The general purpose of the study was explained to them (i.e., that we were interested in how people view the appropriateness of different kinds of buildings in natural settings). Subjects were told they would see triads of slides, each triad containing three different views of a particular building in a coastal-zone area. They were to rate the appropriateness of that building to its particular setting, based on its appearance in the three views. They themselves were to be the judges as to the criteria on which this judgment was to be based.

The 7-point rating scale they were to use, printed on their data sheet via rows of numbers from +3 to -3 for each of the 24 items, was explained. Before they made their first rating, each set of subjects viewed for familiarization purposes, a set of 10 slides taken from a series belonging to 1 of the other groups. This procedure gave them an advance notion of the type and variety of stimuli they would be asked to rate and allowed them to establish a frame of reference for the judgments they would be asked to make once their series of 24 items started.

At the conclusion of the session, subjects were asked to fill out an abbreviated version of the author's "civilism-wildernism" scale, adapted from Hendee's "urbanism-wildernism" scale (see Wohlwill and Heft (1977), for details). The scale was intended to assess the students' preference for or against development and the implements of civilization in the context of a vacation trip into a natural recreation area. They were further asked to rate their familiarity with developed and undeveloped portions of the California coast on a seven-point scale.

RESULTS

The main results of the study are shown in two graphs (fig. 3), which represent the mean ratings of appropriateness for each of the five levels of contrast-obtrusiveness, and for each of the three settings utilized. The data are shown separately for the factory and the lodge.

For both buildings there is an overall, monotonically decreasing function relating judged appropriateness to the contrast-obtrusiveness dimension. This function varies according to the particular context in which the building appears. Statistical analysis reveals the color-contrast variable to be significant beyond the 0.001 level for both buildings, and the interaction between color-contrast and level significant beyond the 0.001 level for the factory and beyond the 0.02 level for the lodge. The graphs indicate the source of the interaction in the case of the factory is in the plain-undeveloped setting, for which the differences among the various colors were least (i.e., the slope of the function was the most shallow). In the case of the lodge,

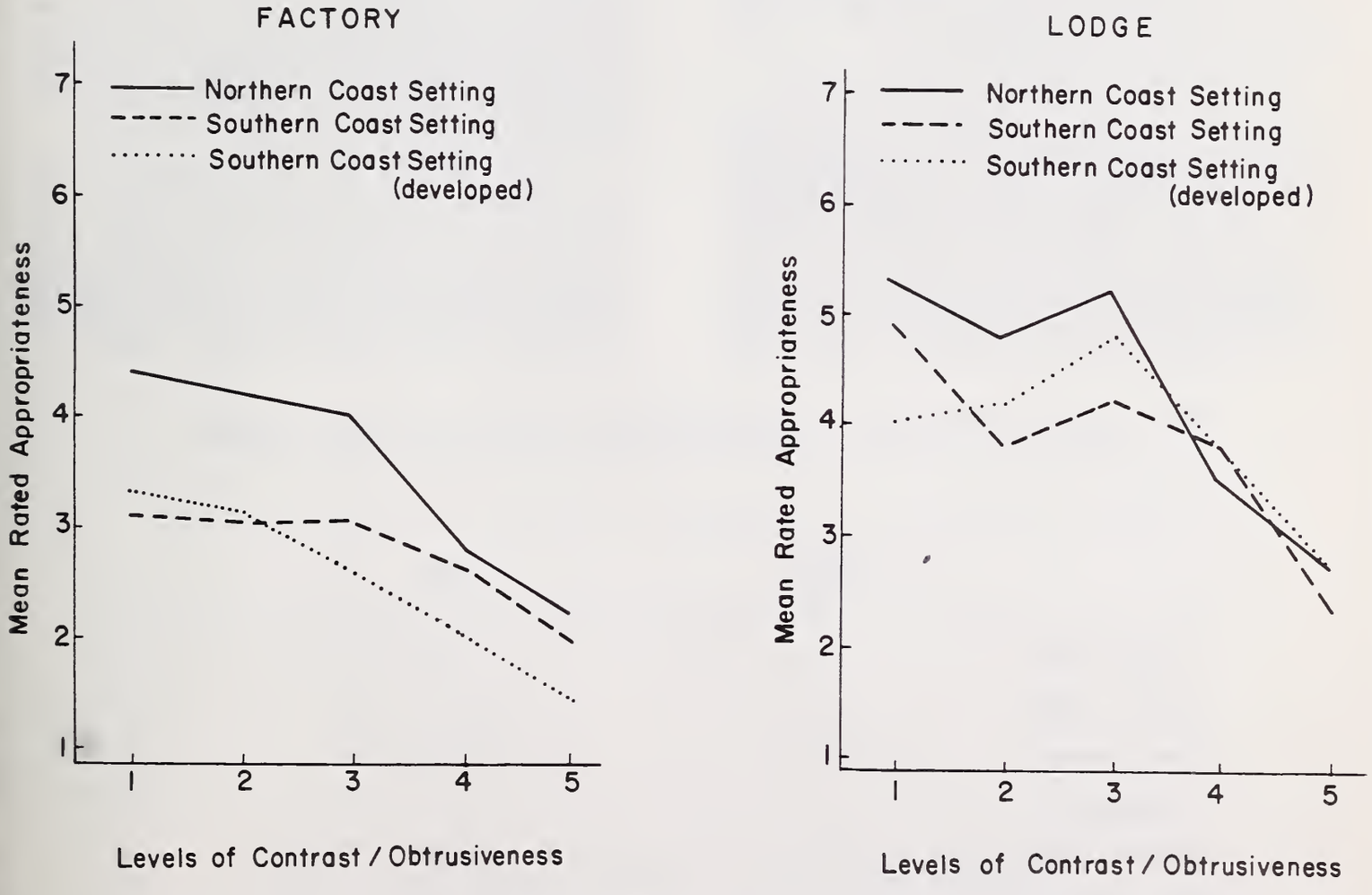

Figure 3.--Mean ratings for appropriateness for factory and lodge, as a function of setting. (Note: "Northern Coast" refers to "scenic" setting; "Southern Coast" refers to "plain" settings.)

it was the plain-developed setting which resulted in the most shallow slope, compared to the other two. It might be noted that overall differences among the three contexts were significant only for the factory ($p < 0.001$); the direction of the effect is apparent from the graph. Finally, overall the appropriateness ratings were consistently higher for the lodge than for the factory.

A final effect relates to the difference between the students in the two groups. The environmental-design majors generally rated the buildings as lower in appropriateness than did the unselected introductory-psychology students ($p < 0.05$). More significant, however, is the finding that, in the case of the lodge, the environmental-design students responded much more strongly to the contrast-obtrusiveness variable (i.e., the slope of their function was considerably steeper). The interaction between group and level was significant beyond the 0.001 level. While the results in the case of the factory were in the same direction, the interaction between groups and levels was not significant.

No relationships were found between the familiarity ratings and the appropriateness ratings, nor between the appropriateness ratings and the civilism-wildernism scores.

Subsidiary Results

The data graphed in figure 3 suggest little difference between the first three levels of the contrast-obtrusiveness scale. Introduction of the white-red versions, particularly in the case of the lodge, created the major effect of this variable on appropriateness ratings. The role of the two variables of color-contrast and size-obtrusiveness was investigated separately, using sets of slide-triads varying only in color (three levels) with size constant at the intermediary level, and only in size (three levels) with color constant at the intermediary level. These comparisons were limited to the scenic and the plain-undeveloped contexts (i.e., the plain-developed context was not utilized).

The results shown are presented in table 1. The statistical analysis indicates significant effects for both color and size ($p < 0.001$ in each case), but for both variables the effects are concentrated in the change between the second and the third levels, corresponding to the shift from the gray-brown to the white-red color, and from the intermediate to the large size (and, in the case of the factory, the auxiliary structures). For both variables the overall ratings were higher for the lodge than for the factory, as they were in the main study (fig. 3). In the case of the size series, the effects of levels of size-obtrusiveness differed for the two structures: the drop from level 2 to level 3 was much sharper in the case of the lodge (where it corresponded to a change from a two- to a four-story building) than the factory. The interaction between the two variables was highly significant. In the case of the color series, the role of the color-contrast variable differed for the two settings: in the scenic context, appropriateness changed little from level 1 to level 2, but dropped precipitously between levels 2 and 3, whereas in the plain context there was a fairly regular decrease from level 1 to level 3.

These findings thus show clearly the scale of contrast-obtrusiveness that we devised for this study is far from linear in its effects. The change from the intermediary to the high level of both the color and the size manipulations produced the major effects; it appears the two variables contributed approximately equally to the overall effects shown in the main study.

Table 1.--Mean appropriateness ratings for "factory" and for "lodge" as a function of differences in color only, and in size only, for "scenic" and "plain" settings

	Factory Levels			Lodge Levels		
Color series	1	2	3	1	2	3
"Scenic" setting	3.7	3.4	2.0	4.9	4.8	3.3
"Plain" setting	3.6	2.9	2.9	4.2	4.4	3.6
Size series						
"Scenic" setting	3.7	3.3	3.3	5.6	5.3	3.7
"Plain" setting	3.5	3.4	2.2	4.3	4.6	3.0

REPLICATION AND EXTENSION

The ratings asked of the subjects in the preceding study, to judge the "appropriateness" of the buildings to their settings, in effect suggested to them a semi-objective mental set, approximating that of the landscape architect or designer in drawing up plans for such a building, or that of an architectural critic providing a professional evaluation of the building. A different type of rating directed at a more subjective response to a building or scene in terms of the viewer's sheer affective reaction to it might well have yielded different results, notably in the sense of a possible inverted-U-shape function such as has frequently been observed heretofore in relation to the attribute of diversity or complexity of stimuli. That is, individuals may well prefer an intermediate degree of contrast between a building and its natural setting, even if they judge it as less than optimally "appropriate" in its context.

A further study was undertaken to compare judgments of appropriateness with ratings of liking on a "like very much" to a "dislike very much" scale. It was not possible to obtain these ratings with a group of California subjects equivalent to that used in the first study. The new subjects were Pennsylvania students. An opportunity thus arose to determine additionally the generalizability of the previous findings to a new group of individuals residing in a different area of the country, specifically outside of a coastal area.

Stimulus series

Each subject made ratings of two series of 15 slide triads; each series contained triads of the factory in one of the 3 settings, in its 5 levels, and the lodge in a different setting in its 5 levels; the remaining 5 triads were filler items. Six subgroups of subjects were utilized, according to the design shown in table 2.

Between the 2 series of slides (i.e., the ratings of appropriateness and liking), the subjects saw a series of 15 individual slides of paintings by landscapes artists. Each slide depicted a prominent man-made feature. A further similar set of 15 slides of paintings followed the second set of the experimental stimulus series. These two sets were rated as part of a separate study.

Subjects

The subjects in this study were 58 students enrolled in courses in man-environment relations at Pennsylvania State University, predominantly sophomores and juniors. They included 41 males and 17 females; their mean age was 21.2 years. Through their course work they had had some exposure to problems in the general area of environmental perception, but no specific involvement in the type of problem of environmental esthetics dealt with in this study.

Procedure

The procedure followed was virtually identical with that described above for the first study, except for the special instructions for the ratings of liking, which specified the subjects were to rate each building in terms of how well they liked it on a seven-point scale from "like very much" to "dislike very much."

The adaptation of the "urbanism-wildernism" scale was omitted from this study, and the familiarity ratings were changed to refer to

Table 2.--Design of replication study

	Group					
Sequence of judgments	I L - A	II L - A	III L - A	IV A - L	V A - L	VI A - L
Factory-appropriatness ratings	S	PD	PU	PU	S	PD
Factory-liking ratings	PU	S	PD	S	PD	PU
Lodge-appropriateness ratings	PD	PU	S	S	PD	PU
Lodge-liking ratings	S	PD	PU	PD	PU	S

Note: S = "Scenic" PU = "Plain-Undeveloped" PD = "Plain-Developed"

coastal areas generally, rather than the California Coast, in deference to the change in geographic locale.

RESULTS

The main results from the replication and extension are shown in figure 4. They confirm those obtained with the California sample only in part. That is, the appropriateness ratings varied significantly as a function of contrast-obtrusiveness for the Pennsylvania students, just as they had for the California students, but the relationship was less consistent and more complex. In the case of the factory, there was an overall decrease in appropriateness with contrast for all groups combined, but as figure 4 shows, this effect was virtually absent in the case of the "scenic" setting, which was precisely the one showing the steepest gradient in the previous study. In the case of the lodge, there is an unmistakable indication of an inverted-U-shape relationship, such that an intermediate degree of contrast is regarded as most appropriate. (In the California data there was, in fact, a similar pattern for judgments of the lodge, under the "plain" setting in the developed version in fig. 3).

As for the other major variables, it is clear for both ratings (appropriateness and liking) the lodge rates higher than the factory, as had been found previously. The role of context shows up significantly only for the lodge, where the scenic setting appears to enhance both appropriateness and liking ratings relative to the two plain settings. In the case of the factory, on the other hand, the interaction between setting and color-contrast found in the first study did not appear in the replication. Instead, for both ratings there was a significant interaction between the contrast variable and the sequence in which the two ratings were made. The interaction took the following form (for both appropriateness and liking): whichever rating occurred first showed a rather irregular, inconsistent change with contrast, while that occurring in the second half of the session showed a rather steeper, roughly linear function. (Thus, the functions for the factory shown in figure 4 are in fact composites of two rather different functions, depending on whether the judgments in question were made in the first or second half of the session.)

DISCUSSION

The results from both the original and the replication study are consistent in one significant respect: they provide concrete testimony to the efficacy of the contrast-obtrusiveness as a primary determinant of rated appropriateness of buildings to their natural surroundings. For both the factory and the lodge, and for both California and Pennsylvania students, the contrast-obtrusiveness variable was a highly significant source of variance of these ratings. The same point applies to the measures of preference (i.e., the ratings of "liking") obtained in the replication study.

This effect appeared to be concentrated at the two upper levels of the contrast-obtrusiveness variable, which (with the exception of the ratings of the lodge in the replication study) yielded consistently low values for both appropriateness and liking. The stimuli at these levels all shared a gleaming white color for the walls of the buildings and a saturated red roof. In addition to the role of the color, the differences encountered in the ratings for levels 4 and 5, involving a marked increase in obtrusiveness (through increase in size and, in the case of the factory, addition of auxiliary buildings) shows the importance of the obtrusiveness dimension, which was corroborated by the supplementary data from the first study relating to the effects of obtrusiveness with color kept constant.

The pattern at the lower levels of the contrast-obtrusiveness variable is less clear. In the first study judged appropriateness showed a generally monotonically decreasing trend as contract increased. The second study revealed suggestions of an inverted-U-shape function, pointing to a possible optimal level of contrast. The fact this optimization trend applied to both the "objective" (i.e., appropriateness) and "subjective" (i.e., liking) data suggests the subjects did not differentiate clearly between these two judgments. At the same time, this finding argues against the view that individuals may personally desire some modal degree of contrast in the environment, while under a more objective mental set they consider a minimum of such contrast as most appropriate--a hypothesis that on the basis of the results of the first study appeared tempting.

Clearly, other variables apart from amount of contrast were important to the subjects as well. The context variable yielded frankly inconsistent results over the two studies, but the tendency of ratings to be most favorable under the scenic setting suggests the operation of a halo effect: instead of judging a building as particularly inappropriate or disliking it most strongly because of its appearance in a highly scenic setting, the subjects tended to give that building the most positive ratings in the scenic setting, possibly because the attractiveness of the setting spilled over, into the judgments of the building itself. (The higher values obtained in the first study for the scenic setting in the case of the factory suggested an alternative interpretation: the wooded surroundings provided a more relevant context for a lumber mill than the other, treeless setting. Yet, in the second study the lodge was rated most favorably in the scenic setting; thus the halo explanation appears to be a more tenable one. Admittedly it fails to account for the lack of a similar effect for the factory in the second study.)

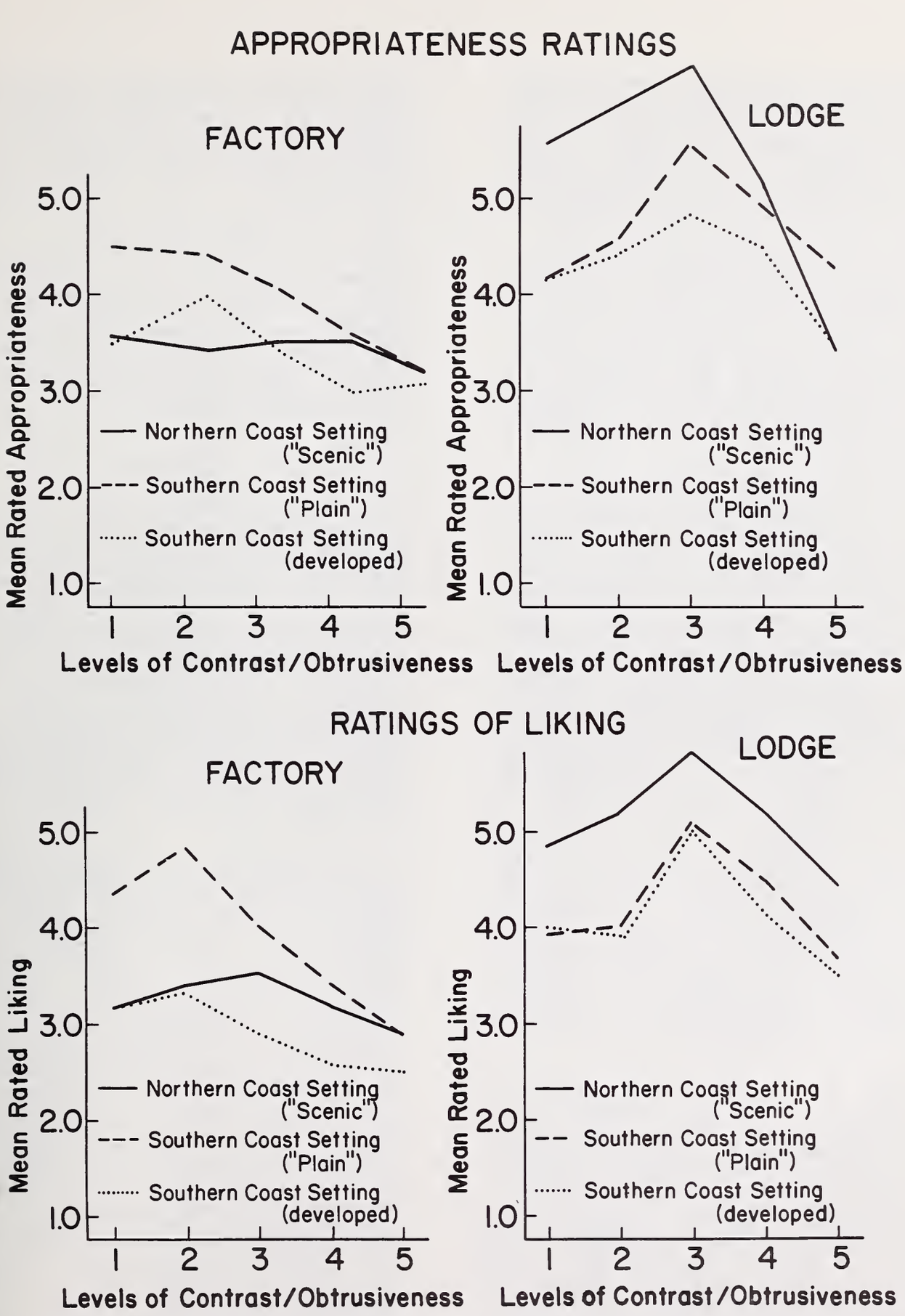

Figure 4.--Mean ratings for appropriateness and liking for factory and lodge, as a function of setting. (Replication Study.)

The data in both studies show more positive responses to the lodge than to the factory. This result in itself is hardly surprising or even noteworthy--one would hardly have predicted otherwise, whether on purely esthetic grounds, or on the grounds of the functional suitability of the two types of structures in these natural settings, or the associations evoked by each.

More interesting is the finding in the replication study that this difference was most pronounced under the scenic setting, as had in fact been hypothesized. The results obtained in the California study did not show such an interaction; indeed, the results came out in the opposite direction. Rather than attempting any purely post-hoc explanations for this discrepancy, it seems best to leave it as an unanswered puzzle, hopefully to be clarified through further research.

The differences between the results obtained from the two populations, both in regard to the difference in the effect of the setting on the ratings of the factory, and in regard to the different shape of the function relating appropriateness to contrast for the lodge, obviously raise the question of what role person-based variables play in esthetic or evaluative judgments of this kind. The California study did disclose a significant difference between the environmental-design students and the unselected students: the former showed greater sensitivity to the contrast variable, as expected. Neither general orientation towards civilization versus wilderness nor sheer familiarity with the coastal settings showed any significant correlations with the judgments, however. A more intensive effort to assess the individual's frame of reference in making the judgments in question is clearly called for. The subjects' associations towards the types of buildings being evaluated, and the subjects' views of the function of those buildings in their particular settings remain unknown. What is suggested here is a comparison between individuals who can be presumed to differ in their attitudes (e.g., between coastal residents for whom the "lodge" might have a direct economic benefit, and conservationists who might not see the lodge as potentially beneficial to themselves).

Finally, the comparison made between "appropriateness" and "liking," although not intended for the purpose, appears relevant to the differentiation that Craik and Zube have offered between preferential and comparative judgments, the former being considered more subjective (e.g., judgments of liking), and the latter involving explicitly or implicitly, reference to some objective standard (e.g., comparison of two buildings in terms of successfulness of the design). It would seem the appropriateness judgments used in this research come close to this comparative model of judgment, at least in the sense of implying a quasi-objective standard against which a given scene is judged. Thus, the fact the two sets of judgments differed little from one another in the replication study, and more particularly that the inter-individual variability of the two sets was closely comparable (whereas Craik and Zube had suggested that consensus should be greater for the comparative than for the preferential judgments) suggests the distinction is in need of further refinement. This conclusion is in line with the findings of Zube et al. (1975), which pointed to rather high intercorrelations between preferential responses and evaluative ones (considered to represent the comparative type), specifically ratings of liking and judgments of scenic quality. Substantially lower correlations, on the other hand, were obtained between either of these measures and more functionally based preference ratings (i.e., preference for each scene as a setting for a particular type of activity).

CONCLUSION

The findings from the present study, along with similar research by the author, as yet unpublished, carried out with ready-made stimuli taken from real environmental scenes scaled for contrast and obtrusiveness, bear out clearly the importance of the contrast-obtrusiveness variable as a determinant of people's affective and evaluative responses to the outdoor environment and confirm that the manner in which man-made structures are integrated into a natural setting is important to the esthetic satisfaction people derive from that setting. The findings should thus be of relevance to the managers of our natural recreation areas and scenic areas more generally, and more particularly to those involved in the design of man-made structures and facilities in these areas.

The findings do not offer a clear prescription for the ideal form such designs should take, not only because the data were not fully consistent, but more importantly because of the limited nature of the population sampled in this research (i.e., groups of college students). Further extension of this research to other populations would clearly be desirable. Nevertheless, solutions such as those envisaged in the recommendations of the California Coastal Zone Commission (1975) for the regulation of development in coastal areas, emphasizing a deliberate blending of all designs into the landscape, in terms of color, texture, and form, and a minimizing of any sense of standing out of the structure from its setting, must be regarded with some suspicion. Undoubtedly both the nature and function of the structure, and the characteristics of the setting will prove to be important aspects of the situation that must be taken into account in formulating guidelines for the design of such development. While the findings suggest a high degree of contrast and obtrusiveness is considered as incongruous, and thus negatively evaluated, some intermediate degree of contrast will, in many instances--such as a residential development in a scenic area--prove optimal. One need only consider the charm of a typical fishing

village with its prevalence of white buildings set off against the oceanfront, or a colorful lighthouse along a seaside bluff, to recognize the falsity of an over-simplistic constrast-minimizing approach to relating the man-made to the natural realm.

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LITERATURE CITED

Berlyne, D. E. 1967. Arousal and reinforcement. p. 15. In Nebr. Symp. on Motivation, 110 p.

California Coastal Zone Conservation Commissions. 1975. California Coastal Plan. Doc. and Publ. Branch, Sacramento, Calif.

Fiske, D. W., and S. Maddi. 1961. A conceptual framework. p. 11-56. In Functions of varied experience, D. W. Fiske, and S. Maddi (eds.) Dorsey Press. Homewood, Ill.

Hendrix, W. G., and J. G. Fabos. 1975. Visual land use compatibility as a significant contributor to visual resource quality. Int. J. Environ. Stud. 8:21-28.

Hopkinson, R. G. 1971. The quantitative assessment of visual intrusion. R. Town Plan. Inst. J. 57:445-449.

Hubbard, H. V., and T. Kimball. 1929. An introduction to the study of landscape design. 2nd ed. Macmillan, New York.

Steinitz, C., and D. Way. 1969. A model for evaluating the visual consequences of urbanization. In Qualitative values in environ. plan.: A study of resour. use in urbanizing watersheds. Sec. III. Off. Chief Eng., Dep. Army, Washington, D.C.

Wohlwill, J. F., and H. Heft. 1977. A comparative study of user attitudes towards development and facilities in two contrasting natural recreation areas. J. Leisure Res. 9:264-280.

Zube, E. H., D. G. Pitt, and T. W. Anderson. 1975. Perception and prediction of scenic resource values of the Northeast. p. 151-167. In Landscape assessment: Values, perceptions, and resources, E. H. Zube, R. O. Brush, and J. G. Fabos (eds.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

A METHODOLOGY FOR SIMULTANEOUSLY OBTAINING AND SHARING INFORMATION[1]

Rachel Kaplan[2]

People's perceptions of and preferences for particular environments have increasingly become the object of study. One may wish to know what environments people consider scenic, how they view particular practices such as strip mining or clearcutting, what feelings they have about the countryside. One wants to know what people notice, what they care about, and how they might view changes. Do they experience the environment differently depending on their background or situation, on their familiarity with the setting, or are these largely idiosyncratic reactions?

Two kinds of issues must be faced when people's perceptions and preferences are studied. One of these involves how the environment under consideration is presented or represented. The other issue deals with the dependent variable--the basis for the inference one makes about people's reactions. Both issues present numerous problems which have a direct impact on the utility of the results. While there is surely no one right way to approach either of these issues, there seem to be a variety of ways that create unnecessary problems.

The purpose of this paper is to illustrate through several diverse studies the advantages of a particular approach to these two issues. The approach is simple and straight forward; the results have been both useful and enlightening. Some of the requirements of the method will be discussed after a brief description of the approach and the sample studies.

PHOTOQUESTIONNAIRE

The common procedure utilized in the studies discussed here is a photoquestionnaire. The pictures, all black-and-white and only about 5 x 8 cm in size, are printed (offset) with eight photos to the page. The studies have varied in number of pages of pictures ranging between three and six. Participants are encouraged to look over all the photographs before responding. As such, the collection of pictures conveys information about the kind of environment under study. The studies all included verbal items in addition to the photographs, but these are not pertinent to the discussion here.

Participants are asked to rate each of the photos on a five-point scale to reflect their preference for the scene. The instructions all say something like "please indicate for each picture how much you like it." Each of the photographs has the numbers 1 to 5 immediately below it, and the participant circles the appropriate value according to instructions. The task is simple and presents no difficulties. (Two of the studies also included familiarity ratings for each of the photos.)

The studies reviewed here share one other feature: The participants in each case had at least some familiarity with the kinds of scenes pictured. That is not to say that all scenes were known to the participants; in fact, in several cases unfamiliar scenes were intentionally included. In each study the photographs were predominantly of the immediate environment of the participants at the time they were responding to the photoquestionnaire.

SOME SAMPLE STUDIES

The first study discussed here was carried out for an agency and as such can be considered "applied." But that study, as well as the three doctoral dissertations which constitute the other examples, cannot be classified in terms of application. All of them were carried out in the field as opposed to the laboratory, with "real people" as opposed to subjects, and had professional groups interested in utilizing the results.

At the same time, all four studies were designed to increase available knowledge about environmental esthetics. While practical results were important, insights into the theoretical underpinnings of this area were no less salient. The informational framework discussed at various times in the context of landscape preference (R. Kaplan 1977b, S. Kaplan 1975) provided the orientation for each of the studies. While the description of the studies here does not include

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[1] Paper presented at the symposium on environmental esthetics at the Ninth Annual Meeting of the Environmental Design Research Association, University of Arizona, Tucson. April 10, 1978.

[2] Author, Associate Professor, School of Natural Resources, University of Michigan, Ann Arbor.

the results, each has found the informational properties to be powerful predictors of landscape preference.

Study 1: Storm drain in a residential area

In Michigan each county has an elected drain commissioner. In the local county some citizens lodged complaints about the open storm drain overflowing into their gardens. The drain in question is about 5 miles long and passes through residential areas representing a wide spectrum of economic conditions. Not surprisingly, the same waterway is an attractive creek in some areas and a shoddily fenced-off eyesore in some other areas. The drain commissioner hired a landscape architect/planner to propose modifications and improvements to the drain, and research was designed to determine the residents' perception of this local feature of their environment.

It was decided words would be insufficient for such a task. As is true of so many environments, one experiences them in a nonverbal way. Strong feelings can be expressed without much difficulty; distinct activities carried out in such a setting can be described; but beyond that, "perceptions of a drain" would not make for easy conversation! Pictures seemed a necessary feature of the study. They could also serve to elicit reactions to potential changes in the drain, thus permitting insight into how modifications would be viewed in addition to perceptions of existing conditions.

The few pretests conducted were most instructive. Several residents who live right along this open storm drain had no idea what interviewers were inquiring about when told the study was about the Swift Run Drain, or the creek that is near their home. As soon as they glanced over the pages of photographs, however, they understood what it was about. The creek, or drain, or whatever it was for them, was a nameless part of their immediate environment; yet they knew it well.

The photographic portion of the questionnaire consisted of 4 pages with a total of 32 scenes (see fig. 1). These included views of the drain all along its course, photos of drains in other parts of the city, and a few scenes from other states. Participants, in all cases residents whose dwellings bordered on the drain, were asked to indicate both how similar their view of the waterway near their home is to what is in the picture and how much they would like that waterway to look like that picture. The photo-questionnaire thus served the dual function of providing information about the environment and eliciting responses from the participants.

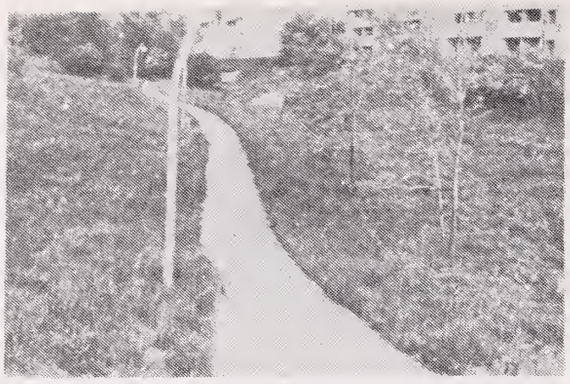
The preference ratings are a source of much more information than likes and dislikes, per se. Examining the most and least liked pictures can certainly be instructive. Beyond that, however, the preference ratings can also show what are perceived as similar types of environments. Then, by examining the preferences for these dimensions or themes, one is in a much better position to anticipate problems in proposing changes, or for that matter, in deciding to leave certain areas unchanged. In the case of the Swift Run Drain, water was not always perceived as an amenity; there are waterscapes that are distinctly unpreferred.

The questionnaire also included verbal analogues to some of the pictured dimensions. The differences in reactions to the visual and verbal formats are informative. I think it is fair to say the verbal descriptions were more likely to lead to stereotypic responses. Thus for residents in the area where the drain had most problems, the thought of piping it underground provided one easy way to eliminate the mess. Photographs representing various versions of a covered drain, however, were not viewed as favorably. On the other hand, appreciation of particular pond-like arrangements need not conjure up the health hazards a few people mentioned in reaction to the verbal description of a body of water left natural, marshy. These findings suggest one can easily be misled by relying on either visual or verbal material alone. Each approach provides some insight into the domain being sampled. A more extensive discussion of the study can be found in R. Kaplan (1977a).

Study 2: Natural landscape in the urban context

The CUNA Mutual Insurance Society office in suburban Madison, Wisc., was the site of Tomas Gallagher's (1977) doctoral dissertation study. The 15 acres of land around the four-story CUNA building are in part maintained as an ornamental landscape with mowed expanses and diverse trees, but major portions of it have been converted to a prairie and woodland restoration, or natural landscape. Gallagher was interested in studying people's preferences for these two distinctly different kinds of landscapes. He desires to introduce more natural landscapes within urban areas, and yet as a landscape designer he was aware such arrangements are not always met enthusiastically. His study involved a test of the informational framework in predicting landscape preferences; his goal was to identify approaches one might use to "achieve public acceptance of natural landscape proposals" (p. 20).

The CUNA landscape experiment is widely known, and CUNA permits use of the grounds for educational field trips. The natural landscape is visible from the CUNA building and the surrounding residential area. The CUNA management was most cooperative with Gallagher's study and permitted a random sample of their 800 employees to participate. In addition to the 137 CUNA employees, the study included a sample of homeowners and apartment dwellers who live immediately adjacent to the CUNA grounds.



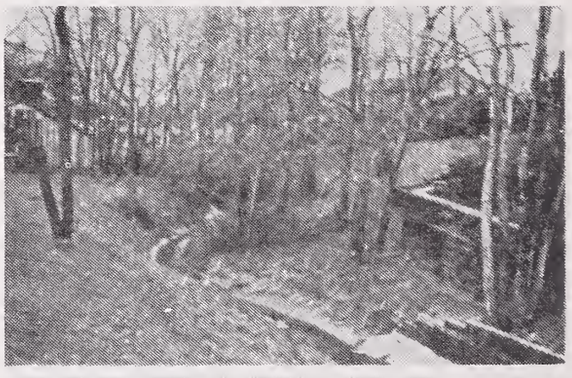


Figure 1.--A sample page from the drain study photoquestionnaire.

All participants indicated their preference for each of the 32 photographs that were taken on the CUNA grounds. The four pages of photos represented the range of settings available in the landscape program there (fig. 2). Pictures were taken at eye level; some included the CUNA building in the picture. In addition to the participants' preference ratings, a panel of judges rated each photograph in terms of a number of predictor variables representing the informational framework underlying the study.

Study 3: Forest practices in a rural setting

Eddie Anderson's dissertation (1978) is also concerned with residents' perceptions of their nearby environment. The setting in this case, however, is a western Michigan rural county where commercial forestry is the principal industry. Most of Lake County is within the boundaries of either national or state forest land. The county's population is low (under 6,000), and unemployment is high (about 13%).

The scenes in Anderson's photoquestionnaire are of hardwood forests, pine plantations, and logged areas. They represent an unspectacular natural environment that is characteristic of the region (fig. 3). All but 2 of the 48 scenes depict local natural settings; they were selected to sample the variety of management practices in use in the region. Although lakes and streams abound in the county, waterscapes were excluded from the study.

One of Anderson's objectives was to compare the environmental preferences of various local groups: blacks and whites, high schoool students and older residents, those with longer term acquaintance with the area, and relative newcomers. The differences between management professionals and the local people are also of interest. In all, some 300 people responded to the survey. They were told the study dealt with the natural surroundings in their area and how "people relate their daily activities with the natural surroundings during both work and leisure time. We would like your help in finding out more about the role that the natural environment plays in the lives of local people."

Anderson found people were, by and large, happy to participate in the study. Many expressed delight with the picture-survey. Even though the photoquestionnaire was quite long (6 pages), people needed little encouragement to complete it and to continue with the remaining pages of questions.

Study 4: Visitors at a bog environment

The setting for William Hammitt's (1978) dissertation study is the Cranberry Glades Botanical Area in the Monongahela National Forest in West Virginia. Unlike those in the other studies, the participants in this case were not in their home or work environment, but rather visitors to the bog. About 60 percent of them were residents of the same state, but for none of them are the Glades in their everyday environment. Hammitt asked some 400 visitors to complete his photoquestionnaire right at the end of their short hike on the bog trail. All were asked to indicate their preference for each scene, and some were also asked to rate the scenes in terms of how familiar they appear.

Included among the 24 photographs were scenes of the various habitats along the trail, scene of the boardwalk itself, and also some scenes the visitors could not have seen on that hike (fig. 4). Some of these were from the same area (e.g., an overview) and others were from a bog environment in another state.

Hammitt was interested in studying the role of familiarity in preference. He examined the preferences of first-time visitors versus repeat visitors, as well as the preferences of people who were shown photographs prior to their hike versus those who saw them only at the end. These comparisons led to some important insights about the role of a leisurely, recreational outing in people's experience of the environment. The photo dimensions, or themes, based on the preference ratings, also shed light on ways to manage and interpret such settings.

SOME COMMENTS ON THE APPROACH

The photoquestionnaire approach has shown itself to have many advantages. First, the method is meaningful to the participants. Not only do they have no difficulty with the task, they enjoy it and invariably express appreciation at being asked to participate. The photos need not be of a high quality, nor are color images necessary. By having the scenes printed, as opposed to projected, the task becomes self-paced and participants can go back and forth over the pages. The participants in the studies described represent a wide range of backgrounds, ages, and abilities. Looking at pictures is not too demeaning for a professional, nor too demanding for a child.

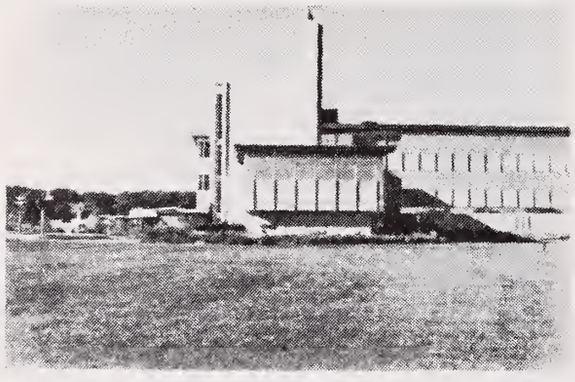
The procedure is inexpensive, manageable, and interesting for the participants, hardly trivial considerations if one takes citizen participation seriously. It is easy to ignore citizen input when the participants seem inarticulate, confused, or even hostile. Given the chance to participate in a meaningful way, citizens give insights and opinions that can be important components in decisionmaking.

Presentation of the environment

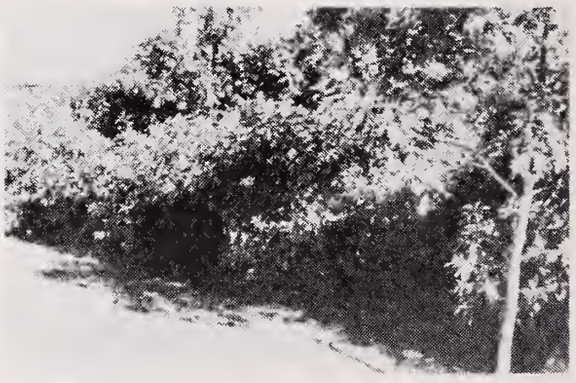
In any environmental assessment the issue of presenting or representing the environment must be considered. An important distinction here involves whether or not one is dealing with an existing environment or situation or one that is being proposed.

1 2 3 4 5

1 2 3 4 5



1 2 3 4 5



1 2 3 4 5

1 2 3 4 5

Figure 2.--One of the pages from Gallagher's photoquestionnaire.

Figure 3.--An example of the photoquestionnaire in Anderson's study.

1 2 3 4 5 no ? yes

1 2 3 4 5 no ? yes

1 2 3 4 5 no ? yes

1 2 3 4 5 no ? yes

1 2 3 4 5 no ? yes

1 2 3 4 5 no ? yes

Figure 4.--Sample page from Hammit's bog study.

There is no single foolproof or accurate procedure for presenting an environment. One can lie with statistics, with words, and with pictures. But photographs do have several advantages. They lend themselves to presenting existing conditions in the study area and comparable areas elsewhere. One can also photograph simulations of an environment, creating visual images of possible alternative solutions. Furthermore, including a variety of pictures of the setting in question does not add much time or expense to the cost of conducting a study. The participants' impressions can be based on a range of examples rather than on one or two instances.

The four studies all used photographs of existing environments. A modification of the procedure described here was used in a study of a proposed downtown park, using photographs of models. In this case, 24 views of possible scenes and settings within the park were presented using 7.5 x 11.5 cm photographs mounted on 4 boards (28 x 33 cm). The scenes were generated from three alternative designs for the park, but participants were asked to react to the individual scenes rather than to the design alternatives. Participants could view the photographs and register their preferences at either the public library or bank lobby, both in the immediate area of the proposed park. For a fuller discussion of this study, see R. Kaplan (1978).

The presentation of the environment is of central importance. Although it is rarely acknowledged as such, the quality of the responses one obtains from participants is necessarily a function of their comprehension of the environment under study. If people are not certain what setting or changes are being discussed, they are put in a difficult situation. The maps and graphics that are so frequently part of public meetings are baffling to many people in the audience.

The selection of photographs must not be taken lightly. The photographs provide information about the setting or changes that are the subject of the study while at the same time being the object of participant reactions. The range of pictures selected must be extensive enough to reflect the full range of conditions present in the study area. In fact, not only is it possible to show and obtain information at the same time, effective sharing is essential if information obtained is to have any validity or usefulness.

Selection of photographs must thus entail two considerations: adequate sampling and the possibility of comprehension. The photoquestionnaire format can easily accommodate some 20 to 40 pictures. This permits judgments of possible alternatives and of a range of examples of each of the settings within the study. Rather than relying on a single instance of a dense woods or open bogmat, for example, there can be three or four instances of such settings. As with any measurement situation, one is on safer grounds having several items represent people's reactions rather than relying on a single instance.

Comprehension is facilitated by having visual material, but all graphic material is not equally effective in communicating information. The problem of comprehension is particularly acute when communicating about environments not yet existent. But even for existing conditions, one can select photos that are difficult to understand, that provide too much detail, or that fail to communicate scale. It is hard for the professional to realize, but some graphic material is more confusing than helpful (S. Kaplan 1977). Pretesting the material with a group of nonprofessionals is essential.

Extensive sampling of the environment has one further advantage that should perhaps be mentioned. While the studies have direct application to field settings, they need not compromise the desire for more systematic and controlled approaches possible in the laboratory setting. In photographic form, the scenes are highly transportable and can be taken to the participant. But at the same time, by careful selection of the visual material, many hypotheses can be tested, and the basic knowledge of environmental preference can be advanced.

Getting the information

There are many ways to study people's reactions. Public participation often involves public meetings where those who wish speak their minds. One is often tempted to ask people what they like and why they prefer certain settings over others. These questions turn out to be much easier to ask than to answer. Given the frustration such a seemingly direct approach yields, some researchers opt to stay clear of asking anything. Instead, they record how places are used. These observations then are used as an indication of environmental preferences. While it might be safe to assume that a well worn path across the lawn suggests a place where some would like a walkway, some other inferences based on observations are more controversial. One highly regarded social scientist has been telling us that crowded sidewalks in New York City are an indication of preference. He even shows some pictures of people smiling. (He does not mention the crowded subways, however.)

One approach to getting people's reactions is based on the preference ratings, using a five-point scale. People seem to have no trouble with this task. Indicating how much they like a scene is manageable and enjoyable. Because there are a number of scenes to rate, each one need not be belabored. Because they are not rating each scene for a multitude of adjectives, many more scenes can be included in the study.

As indicated earlier, the simplicity of the procedures does not limit the richness of resulting insights. Knowledge of the preferences of

particular scenes is valuable to a certain degree. If one only shows people a handful of pictures, then the preference for each is all one has to examine. With 20 to 40 scenes, however, the preferences for each item becomes less instructive. One quickly discovers scenes representing comparable environments from the professional's point of view, may be regarded as quite different in terms of the citizens' preferences.

By subjecting the preference ratings to dimensional analyses, one can determine much more than which scene is liked and which is not (R. Kaplan 1974, 1975). Validity and reliability are both enhanced by the use of many instances. The dimensional procedures provide an indication of the internal consistency of each factor or grouping. The Cronbach Coefficient Alpha value across these studies ranges from the 0.70's to the 0.90's. In fact, one can begin to get answers to the elusive question of why some settings are preferred. The patterns of preference ratings, as opposed to the particular examples, provide an indication of the underlying similarities among the scenes in the study from the perspective of the participant. To some extent these themes or groups parallel the basic categories used in a typical visual resource assessment. To the extent that they do not, they are particularly useful in extending our insight in the area of environmental perception and preference. For a discussion of the sorts of groupings of content obtained in these and related studies, see S. Kaplan (1978).

Using photographs hardly constitutes a new method, but the procedure described here has many attractive features even if novelty is not one of them. The interrelated problems of providing information about an environment and asking information about it are easily accomplished by using a variety of examples through photographs. The method is inexpensive and readily adapted to many problems of environmental assessment. The photoquestionnaire combines elements of laboratory slide rating experiments, surveys, and interactive participatory procedures. It is a method that is meaningful to participants and allows them to proceed at their own pace. The method lends itself to providing alternatives that can be compared in parallel and permits extensive stimulus sampling.

The procedure has been received enthusiastically not only by the participants; agencies involved in the studies have also enjoyed the process and received the results eagerly. After all, generating information that is both useable and useful is an urgent need in the area of environmental preference.

LITERATURE CITED

Gallagher, T. J. 1977. Visual preference for alternative natural landscapes. Ph.D. diss., Univ. Mich., Ann Arbor.

Hammitt, W. E. 1978. Visual and user preference for a bog environment. Ph.D. diss., Univ. Mich., Ann Arbor.

Kaplan, R. 1974. A strategy for dimensional analysis. In Man-environment interactions: Evaluations and applications, D. H. Carson (ed.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, R. 1975. Some methods and strategies in the prediction of preference. In Landscape assessment: Values, perceptions, and resources. E. H. Zube, R. O. Bruch, and J. G. Fabos (eds.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, R. 1977a. Preference and everyday nature: Method and application. In Perspective on environment and behavior, D. Stokols (ed.) Plenum, New York.

Kaplan, R. 1977b. Down by the riverside: Informational factors in waterscape preference. In River recreation manage. and res. symp. USDA For. Serv. Gen. Tech. Rep. NC-28. North Cent. For. and Range Exp. Stn., St. Paul, Minn.

Kaplan, R. 1978. Participation in environmental design: Some considerations and a case study. In Humanscape: Environments for people. S. Kaplan and R. Kaplan (eds.) Duxbury Press, Belmont, Calif.

Kaplan, S. 1975. An informal model for the prediction of preference. In Landscape assessment: Values, perceptions, and resources, E. H. Zube, R. O. Brush, and J. G. Fabos (eds.) Dowden, Hutchinson, and Ross, Stroudsburg, Pa.

Kaplan, S. 1977. Participation in the design process: A cognitive approach. In Perspective on environment and behavior, D. Stokols (ed.) Plenum, New York.

MEASUREMENT OF PREFERENCES FOR PROPOSED LANDSCAPE MODIFICATIONS[1]

John H. Schomaker[2]

Public involvement and input are common and accepted parts of public land management today. Public meetings and workshops are an integral part of the USDA Forest Service land use planning process, for instance. The public is frequently given the opportunity to evaluate proposed classification or management alternatives. The public has not been routinely included, however, in decisions primarily concerning esthetics. The shape of a clear-cut, the route of a transmission line, or the layout of a road have generally not been included in the public involvement framework.

Evaluation of proposed landscape modifications has primarily been the concern of professional landscape architects. Professionals have assumed that their standards of scenic beauty are the same as the public's. Professionals design and implement landscape modifications, but the untrained public ultimately evaluates the scenic quality resulting from these management decisions. Recent legislative efforts and legal suits indicate professionals can no longer base decisions solely on what they deem best, ignoring public input. Public input to the decision-making process reduces the discrepancy between public land management goals and public desires.

Given present circumstances, the primary objective of this study was to develop a methodology to determine public preference for alternative forms of proposed landscape modifications. Ideally, in this kind of method development it would be desirable to measure people's preferences for sketches of proposed landscape modifications, make the modifications, and then measure people's preferences for the actual field modifications. The costs and technical requirements of this ideal situation are prohibitive. The study was simplified in an attempt to determine whether preferences for sketches can be used to predict preferences for photographed scenes.

Given the wide range of scenes and modifications of interest in this study, photographic slides were chosen as the primary or reference stimuli. Transporting observers into the field would have been too costly, and past workers (Boster and Daniel 1972; Shafer and Richards 1974) have found agreement between field observations and ratings of slides.

A second objective of the study was to determine the extent to which public and professionals agreed on preferences for proposed landscape modifications. The procedure and results of this substudy are discussed below with the main study.

PROCEDURE

Color slide representations of 48 landscape scenes depicting timber harvest areas, roads, utility installations, and ski slopes in otherwise undeveloped mountain areas were selected for the study. The modifications exhibited various degrees of "naturalness" and varied in distance from the camera. The slides included 19 timber harvest areas, 14 roads, 12 utility installations, and 3 ski areas.

All the landscape scenes were also represented as black-and-white and color sketches. An advanced student in landscape architecture first prepared a black-and-white sketch from each landscape slide. A copy of each black-and-white sketch was then tinted to approximate the coloration of the original slide. Both the black-and-white sketch and the tinted sketch were then photographed to produce slides for presentation to observers.

Black-and-white sketches were also selected from the USDA Forest Service publications, "Forest Land Management" and "National Forest Landscape Management," to illustrate 32 different landscape modifications designed by professional landscape architects. The sketches selected included nine pairs depicting several timber harvest options, utility installations, and roads. All of these sketches were photographed and represented in the study as slides. In addition, two series of seven slides each were also selected.

1/ Paper presented at the symposium on environmental esthetics at the ninth annual meeting of the Environmental Design Research Association, University of Arizona, Tucson April 10, 1978.

2/ Author was Assistant Professor, Wildland Recreation Management, College of Forestry, Wildlife and Range Sciences, University of Idaho. Now with USDA Forest Service, North Central Experiment Station, St. Paul, Minn.

Each series depicted a variety of ways a particular area could be harvested: large and small scale harvests, and naturalistic, rehabilitative, and landscape deterioration methods. Because the preferences of professionals for each pair or series of scenes was given, these slides served as the basis for the professional and public preference comparison.

Based on the 48 original landscape scenes there were 48 color slides of the actual scenes, 48 slides of black-and-white sketches, and 48 slides of tinted sketches. This set of 144 slides was reduced by randomly eliminating 33 of the black-and-white sketch slides, leaving a total of 111 slides. In addition to this set, 16 duplicate slides were prepared to provide a test of observer judgment reliability; 1 black-and-white sketch slide, 11 tinted sketch slides, and 4 color slides of the actual landscape scenes. Combined with the 32 slides of professional sketches selected from Forest Service publications, a total of 159 slides were presented to the observer panel.

A total of 110 observers, students at the University of Idaho, rated the slides. The raters included 69 forestry students, 14 landscape architechture students, and 27 students from other disciplines.

The rating procedure was adopted from Daniel and Boster (1976). The observers were asked in standard instructions to evaluate each slide and assign a numerical value to the scene depicted. Values ranged from zero, indicating very low scenic beauty, to nine, indicating very high scenic beauty.

Observers were permitted 8 seconds in which to view and judge each slide, and record their ratings on computer optical scanning sheets. Slides of the black-and-white sketches, tinted sketches, and of the actual landscape scenes were shown in separate sets. The slides in each set were randomly ordered. Four sample slides were shown at the beginning of each set. An 8-second rest was included after every tenth slide and students were given a 5-minute break between sets. Computer cards were punched directly from the optical scanning sheets.

RESULTS

Throughout the data analysis the ratings were assumed to form an interval scale. Although this assumption is probably not totally valid, serious errors are not introduced by the assumption. Initially the rating data were transformed into $\bar{Z}$ scores to form an interval scale by means of the Law of Categorical Judgment (Torgerson, 1958). Compared to the analysis of the simple ratings, the $\bar{Z}$ transformation had only a small effect on relative scale values and resulting correlations. Because the complexity of the transformation calculations was judged counter to the intent of keeping the method simple to encourage its use to gain public input, it was decided to base all analyses on the simple observer ratings.

Judgment Reliability

Reliability of the ratings was estimated using a test-retest procedure based upon the 16 duplicate pairs of slides imbedded within the 159 total slides. A potential problem with comparing duplicates is the possibility that subjects would remember their ratings within a duplicate pair and consequently not give independent ratings. Rapid projection of the stimuli, mirror-image positioning of duplicates, random ordering, and the large total number of slides would all be expected to minimize the recall bias. The test-retest reliability was obtained by correlating observer judgments of the duplicate slide pairs. The average correlation for all 16 pairs was 0.67. Given that this reliability applies to the average test-retest reliability of a single scene, the magnitude is encouraging and acceptable.

Comparison of Alternative Representations

To determine the suitability of tinted sketches for representing landscapes and landscape modifications, ratings of the 48 slides of actual landscapes were compared to the ratings of slides depicting colored sketches of these same 48 landscape scenes. Average ratings for the color-sketch slides and the original landscape slides were used as the independent and dependent variables, respectively, in linear regression. The regression equation was $Y = 0.95 + 0.95X$, where X is the average rating of a color-sketch slide and Y is the predicted rating of the corresponding slide of the actual landscape.

Several aspects of the regression equation and related statistics are interesting and useful. First, the intercept (0.95) indicates that slides of the color sketches were generally rated one scale unit lower than the original landscape slides. Second, the slope (0.95) approximates unity, indicating that a one-unit increase in scenic beauty ratings for slides of the color sketches approximates a one-unit increase in the rating of the original color slides from which the sketches were made. The square of the correlation coefficient (0.74) indicates that 55 percent of the variance in Y is accounted for by X.

An estimate was made of the required difference between two predicted values before one could have confidence any two slides of different scenes were indeed rated differently. With 100 raters and a significance level of 0.05, the difference in mean ratings required for two scenes to be considered statistically different is 2.2. Thus, if two predicted scores are a little more than two scale points apart, one can be confident that one photograph is rated higher in scenic beauty than the other.

The sketches by the landscape architecture student had originally been accepted without

critical analysis. Subsequently, however, a three-member panel consisting of the two study investigators and a recreation planner looked at each slide pair projected side-by-side and independently decided whether the sketch depicted the actual landscape photograph well or not. After looking at all pairs, ratings were discussed and a consensus was reached for each pair. In general, there was little disagreement on the ratings. The sketches that were considered poor representations did not depict the color, depth, or distance of the actual photograph accurately. A typical problem was that modifications were much more pronounced in the sketches than in the photographs.

Ratings of color-sketch slides and of the original color slides were then related through linear regression for the scenes judged as being adequately represented by the sketches. The resulting regression equation was $Y = 0.59 + 0.93X$, with an R^2 of 0.71. Thus acceptance of sketches that were judged to be representative of the original color slides they depicted led to an increased predictive capability. The equation for the selected scenes might be thought of as a limit of predictability for this technique. The three panel members were able to compare the sketch directly with the actual photograph, an advantage not available for proposed landscape modifications. For those selected slides and 100 raters, 1.5 is the minimum difference between predicted means necessary for one to have confidence that the ratings were statistically different at the 0.05 level.

As a matter of interest, regression analysis was also performed on the slides of the 15 black-and-white sketches and the corresponding original color slides. The equation was $Y = -0.43 + 1.26X$ with an R^2 of 0.46. For this particular set of scenes, the tinting of the sketches resulted in a much better correspondence with ratings of the actual landscape slides; the R^2 for tinted sketches and actual photographs for these same scenes was 0.76.

An additional analysis was performed to gain insight into the ratings of color-sketch slides and landscape slides. The photograph-sketch correlations for the top and bottom quartile of scenic beauty ratings were compared. It was hypothesized that rater reaction to dominant man-made features in the landscape, such as geometric clearcuts and power lines, might be more consistent than those for landscapes with less dominant features. Correlation was calculated for pairs in which the color sketch had a mean rating of less than 2.66. A similar correlation was calculated for slide pairs with sketch-slide ratings above 4.21. The correlation coefficient for the bottom quartile of 12 pairs was 0.64. For the top quartile the coefficient was 0.10. Due to range restriction, the correlation coefficients are lower than the coefficient for all 48 pairs, but the difference between the correlation coefficients for the 2 quartiles is notable. Raters do respond more consistently to sketch slides and actual slides on the lower end of the rating scale. This is undoubtedly due to the dominant feature aspect of the landscapes on the low end of the scale and the poor representation of the more spectacular scenery in the sketches of the highly rated landscape scenes.

Comparison to Professional Judgment

The USDA Forest Service offers guidelines for landscape modifications in its series of publications, "National Forest Landscape Measurement." Nine pairs of sketches and two series of seven sketches each were selected from these publications and photographed for presentation to our observers. In no case did the "nonprofessional" raters' judgments of these scenes disagree with the professional preference for one modification alternative over another.

Ratings of both the seven-slide series of sketches were compared using Duncan's multi-range test. As an example, the results of Duncan's test for one of the series are summarized in table 1. The order of rating is consistent with the judgment of the professional landscape architiects.

Table 1. Duncan's multi-range test results for mean ratings of professional sketches

Scene number	1a	1b	1c	1d	1e	1f	1g
Mean[a]	2.86	3.39	4.50	5.02	5.30	6.18	6.84

[a]Two means not underscored by the same line are significantly different at the 0.05 level. Two means underscored by the same line are not significantly different at the 0.05 level.

Based upon the ratings of slides of the professional sketch pairs and series, the conclusion is nonprofessionals exhibit the same preference rankings for landscape modifications as professional landscape architects. The raters in this study were exclusively university students and may not be representative of the public at large. However, given the magnitude of the differences between the ends of the seven-item series, it is highly unlikely that the general public would respond differently.

DISCUSSION

Given the results of this study, how might sketches be used to gather public input on proposed landscape modifications? The first task would be to prepare slides for presentation at a workshop. A series of slides representing proposed landscape modifications would be required. For a given modification, say a power line installation, two or three alternatives should be chosen for evaluation. The alternatives might include the most economical installation, an esthetically pleasing alternative (as judged by a professional landscape architect), and a compromise alternative. Several sketches should be made for each modification alternative. Each sketch should depict the alternative as viewed from a different perspective. Actual photographs and slides of sketches of the unmodified landscape should also be made from the same perspectives. By presenting several perspectives of the same scene, a more realistic and reliable measure of the public's reaction will be possible. This series of slides, presented in random order, should allow adequate ranking of the alternative modifications.

It would also be desirable to prepare approximately five sketch-photograph pairs expected to cover the complete range of the scenic beauty scale. These pairs would establish the regression line for predicting photograph ratings from sketch ratings. This set of actual photographs and slides of sketches intermixed with the slides of modification sketches would also help reduce any biased ratings of the modifications because of recall from one scene to another. The regression line would indicate whether public workshop participants generally rated the sketches lower than corresponding photographs as the raters did in our study. The extra sketch-photograph series spanning the scenic beauty scale would place the values for the proposed modifications on a scale that had its basis outside the study area. If the same extra series were used in a number of studies, the series could become a common reference scale to compare severity of modifications among different areas.

After the rating of randomized slides by workshop participants, data analysis similar to that performed in this study would be a simple matter. Comparison of the proposed modifications is straightforward given the regression line and the ratings for each modification. If an agency only wanted to compare ratings within one set of possible modifications and did not project to ratings after modification, it would not be necessary to establish a regression line.

One final note is necessary. Even if completely successful, this technique has the same characteristics as other public input techniques. That is, this technique will give decision-makers additional input, but it will not make decisions. Like letters, petitions, and questionnaires, the input from this technique must be weighted and judged. The primary advantage of using this technique is that esthetic evaluation can be incorporated with other technical evaluation data in the decisionmaking process.

LITERATURE CITED

Boster, Ron S., and Terry C. Daniel. 1972. Measuring public response to vegetative management. p. 38-43. In Proc. 16th Annu. Ariz. Watershed Symp., Ariz. Water Comm., Phoenix.

Daniel, Terry C., and Ron S. Boster. 1976. Measuring landscape esthetics: The scenic beauty estimation method. USDA For. Serv. Res. Pap. RM-167, 66 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Shafer, Elwood L., Jr., and Thomas A. Richards. 1974. A comparison of viewer reactions to outdoor scenes and photographs of those scenes. USDA For. Serv. Res. Pap. NE-302, 26 p. Northeast. For. and Range Exp. Stn., Broomall, Pa.

Torgerson, W. 1958. Theory and methods of scaling. Wiley Co., New York, 460 p.

U.S. Department of Agriculture, Forest Service. 1972. Forest landscape management, Volume 1. 137 p. Northern Reg., Missoula, Mont., Sup. Doc., Wash., D.C.

U.S. Department of Agriculture, Forest Service. 1974. National forest landscape measurement, Volume 2. U.S. Dep. Agric. Handb. 462, 47 p. Sup. Doc., Wash., D.C.

Daniel, Terry C., Ervin H. Zube, and B. L. Driver (tech. coord.). 1979. Assessing amenity resource values. USDA For. Serv. Gen. Tech. Rep. RM-68, 70 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Papers from a workshop and symposium at the Ninth Annual Meeting of the Environmental Design Research Association discuss identifying environmental features responsible for perception of environmental quality, dimensions of wilderness experience, uses of wildlife, integrating user-based assessments with economic models, and the interface of natural and urban landscape elements.

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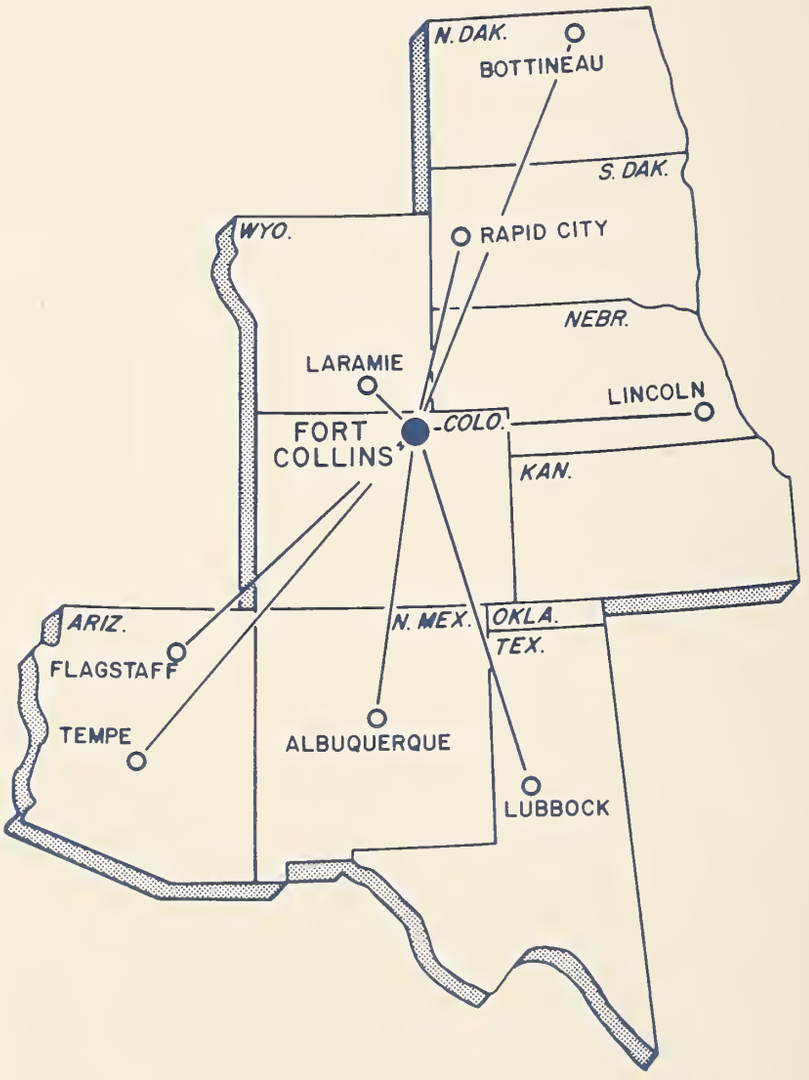
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